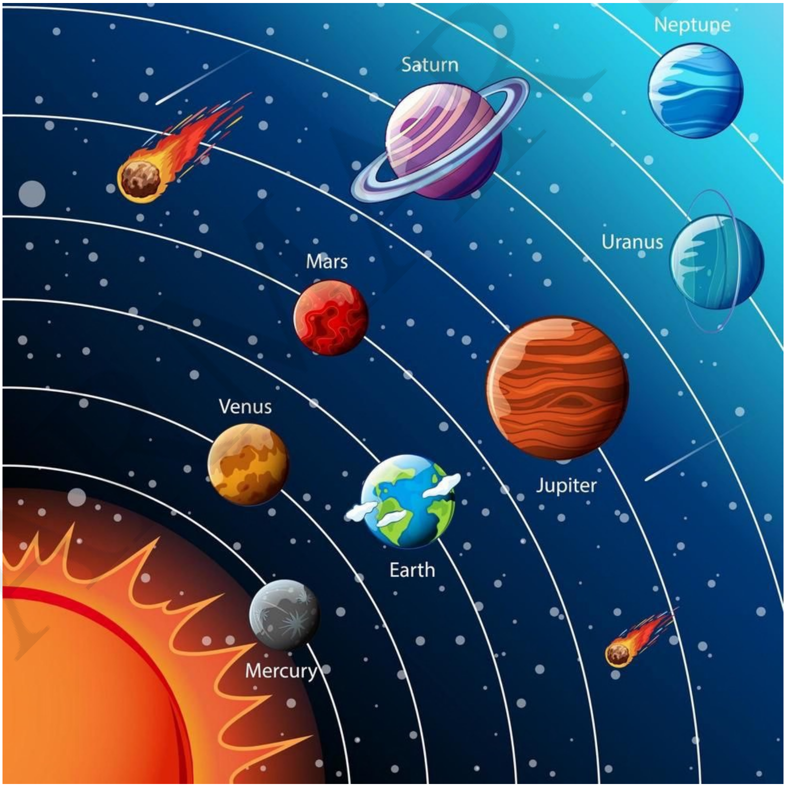
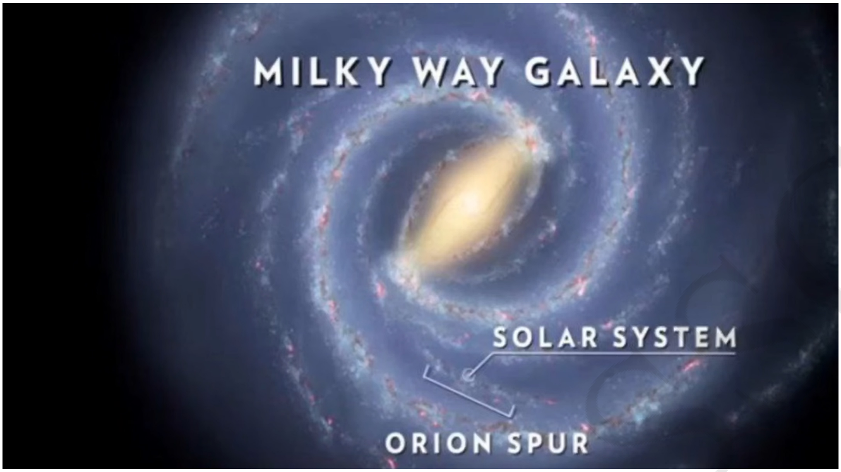
SOLAR SYSTEM


Neptune
Saturn
Uranus
Mars
Jupiter
Venus
Earth
Mercury


MILKY WAY GALAXY
SOLAR SYSTEM
ORION SPUR

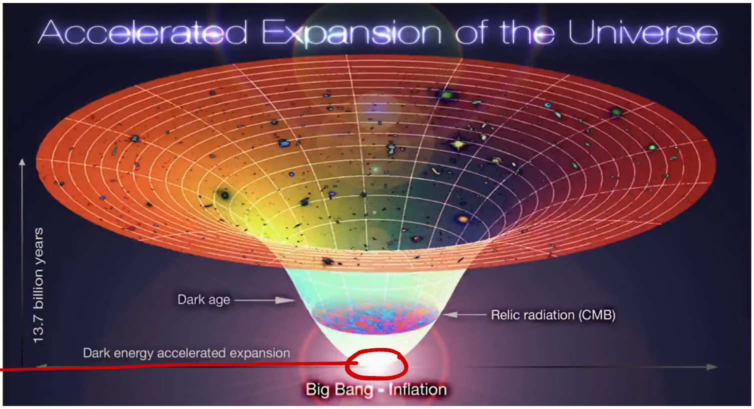
- Nearest galaxy: Andromeda Galaxy
- Study of Universe: Cosmology

Universe
↓
Milky Way Galaxy
↓
Solar System
↓
8 planets

ORIGIN OF UNIVERSE

Theories given:

- BIG BANG THEORY


Accelerated Expansion of the Universe
13.7 billion years
Dark age
Relic radiation (CMB)
Dark energy accelerated expansion
Big Bang - Inflation

Infinitely hot and dense single point → Exploded

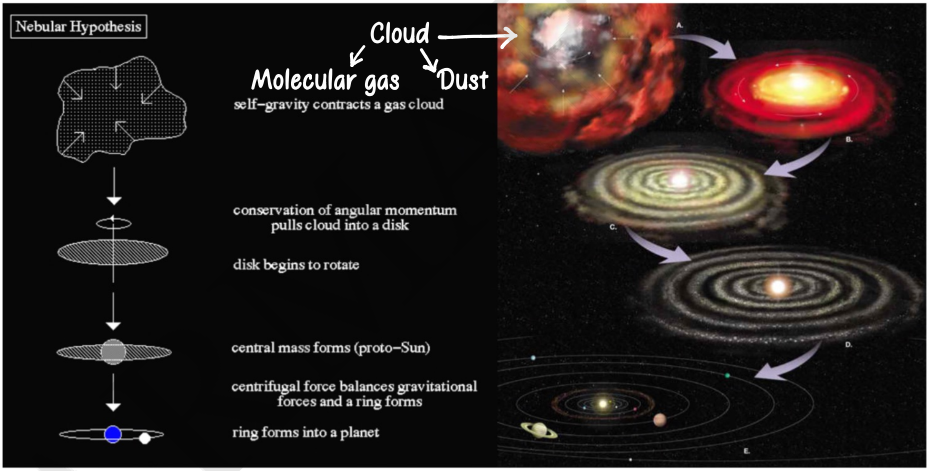
George Lemaitre: 1931
Edwin Hubble → Increase in distance of celestial bodies

↓

Origin of Big Bang Theory. Also, known as Big Bang Explosion → Explosion → 13.6 billion years ago

FORMATION OF OUR SOLAR SYSTEM → 4.5 billion years ago

- **Nebular Theory, 1755**: by Immanuel Kant
  1796: modified by Laplace
- **Nebula:** A giant cloud of dust and gas


Nebular Hypothesis
Cloud
Molecular gas
Dust
self–gravity contracts a gas cloud
conservation of angular momentum pulls cloud into a disk
disk begins to rotate
central mass forms (proto–Sun)
centrifugal force balances gravitational forces and a ring forms
ring forms into a planet
A.
B.
C.
D.
E.

- H_2 + He → Nuclear Fusion
- H + H → He → Formation of Sun (mostly made of H_2 and He

  ↓

  H_2 → 70%

- **Indian Institute of Astrophysics HQ: Bangalore**

CELESTIAL BODIES

Two types:

- Luminous: Self-glowing, eg: stars
- Non-Luminous: Not self-glowing, but can reflect light from other sources. Eg: Moon

1. Asteroids: they are small, rocky objects that orbit the Sun
2. Meteoroids/Meteors: enters Earth's atmosphere and burn up in Mesosphere (shooting stars)
3. Comet: Small icy dirt balls that orbit the Sun, burn upon reaching Sun
4. Stars

- Stars: luminous bodies
- Colour: Depends on temperature
- Group of stars: Constellation
  ↓
  - Largest: Hydra
  - Urja Major: Sapta Rishi
- Brightest star in Orion Constellation: Rigel
- Brightest star in night sky (overall): Sirius (Dog Star)
- Closest star to Earth: Sun → Distance from Earth: 150 million km (1.5 x 10^8 km)
  ↓
  After Sun, it is Proxima Centuri
- Light Year/Parsec: celestial distances
- 1 LY: 9.46 x 10^{12} km
- 1 Parsec: 3.26 LY

- India's first Solar Mission
  ↓
- ADITYA L1 mission ISRO, India

Sun

- The only star in our solar system and powerhouse of solar system
- Composed of Hydrogen (73%), Helium (25%) and other metals
- Carries 99% mass of our solar system
- Approx 109 times of Earth
- Takes 8 minutes 30 seconds for light at speed of 3 lakh km/sec to reach Earth
- Temperature at surface = 5800 K/5600 C
- Temperature at centre = 15.7 million K
- Outer layer: CORONA

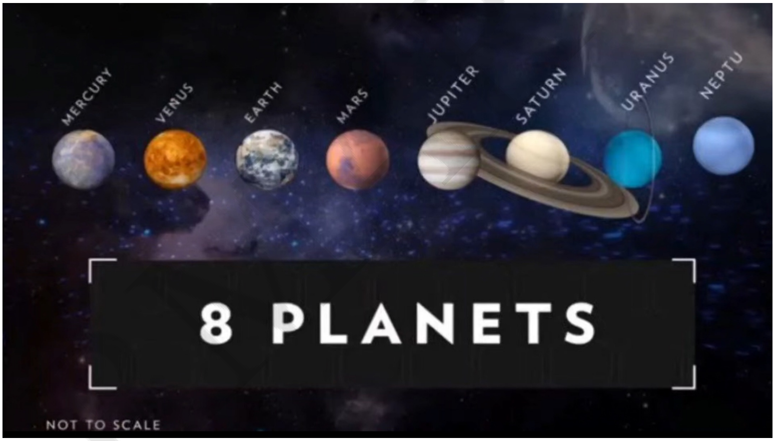
Moon

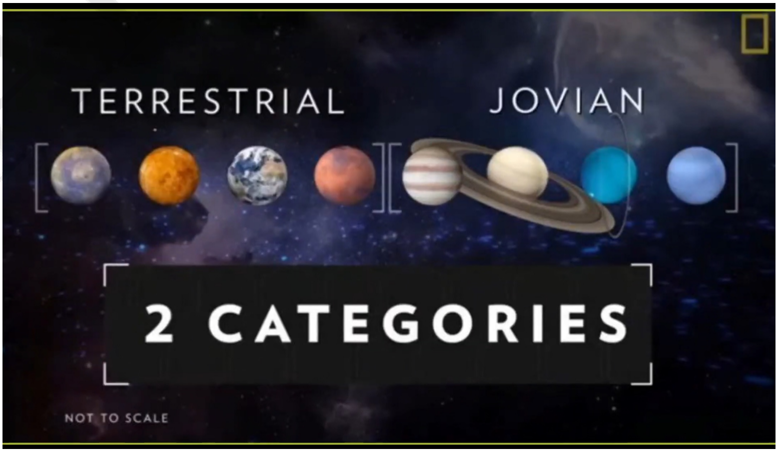
- Earth's natural satellite
- Non-Luminous
- Radii: 1.74×10^6 km
- Time of Moon's light, takes to reach Earth: 1.26 secs
- Distance b/w Earth and Moon: 3,84,000 km
- Gravity = $\frac{\text{Earth's gravity}}{6}$
- Rotation = Revolution (same)

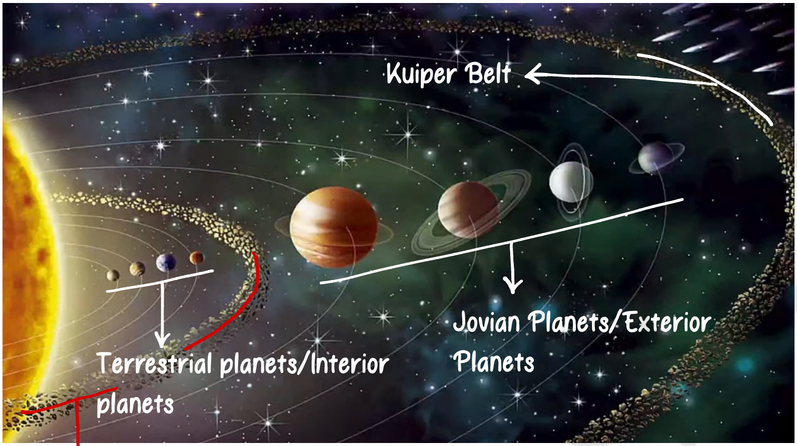
$\downarrow$

27.3 days → Only one side of the Moon is visible (far side)

- Rotation: object's spinning motion about its axis
- Revolution: object's orbital motion around another object
- All planets rotates from West to East (anti-clockwise) except Venus and Uranus (clockwise)


MERCURY
VENUS
EARTH
MARS
JUPITER
SATURN
URANUS
NEPTU
8 PLANETS
NOT TO SCALE

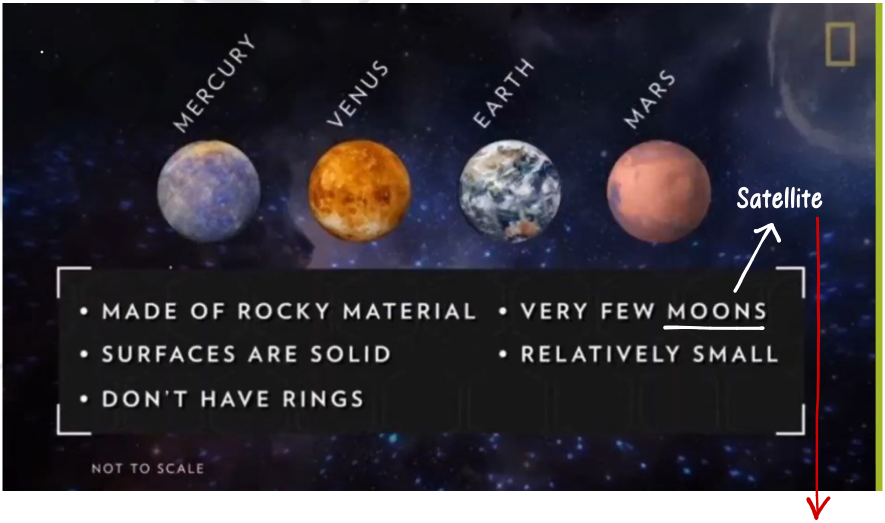

TERRESTRIAL
JOVIAN
2 CATEGORIES
NOT TO SCALE


Kuiper Belt
Jovian Planets/Exterior Planets
Terrestrial planets/Interior planets

Asteroid Belt: b/w Mars and Jupiter

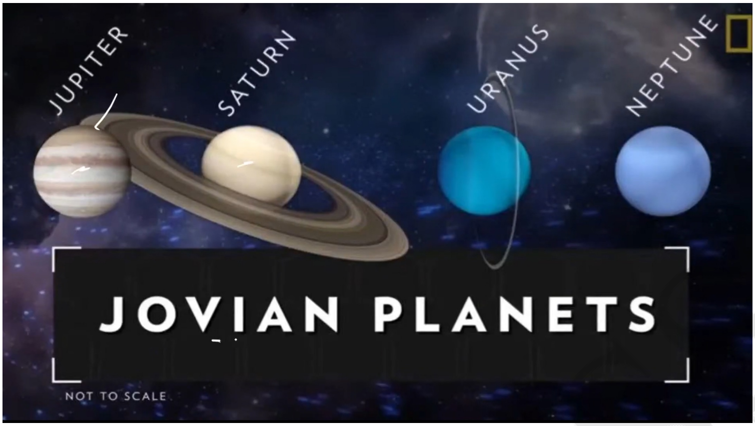
- Pandit Jasraj becomes the first Indian musician to have a minor planet named after him: Panditjasraj (300128) → Derived from his date of birth, 28 Jan 1930

- Characteristics of Terrestrial Planets


MERCURY
VENUS
EARTH
MARS
Satellite
NOT TO SCALE

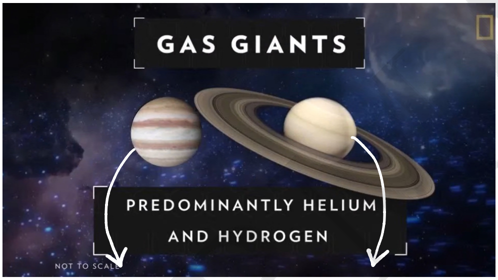
- MADE OF ROCKY MATERIAL
- SURFACES ARE SOLID
- DON'T HAVE RINGS
- VERY FEW MOONS
- RELATIVELY SMALL

Revolves around planets



JOVIAN PLANETS

NOT TO SCALE

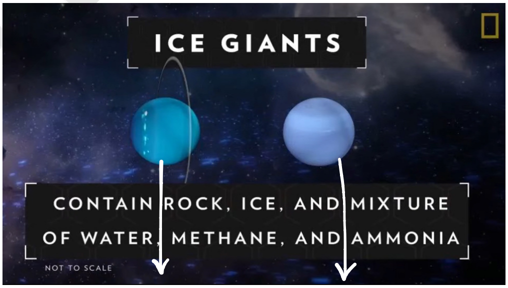


GAS GIANTS

PREDOMINANTLY HELIUM AND HYDROGEN

NOT TO SCALE

Jupiter Saturn



ICE GIANTS

CONTAIN ROCK, ICE, AND MIXTURE OF WATER, METHANE, AND AMMONIA

NOT TO SCALE

Uranus Neptune

1st Planet: Mercury

- Closest planet to Sun
- Smallest planet in solar system
- Diameter: 4900 km
- Fastest planet, takes 88 days to complete revolution around Sun
- Planet with no satellite
- Planet with no water and gases like Nitrogen, Hydrogen, Oxygen, and Carbon Dioxide

PARAS SSC

2nd Planet: Venus

- Hottest planet in solar system: traps the gas easily, has thick clouds of H_2SO_4 and CO_2
- Brightest planet in Solar System, also known as "Evening Star" and "Morning Star"
- No satellite/Moon
- Also known as "Earth's Twin" due to similar mass and size
- Rotates clockwise

3rd Planet: Earth

- the only planet to give support to life
- Also known as "Blue Planet": 70% water
- It has one satellite: Moon
- Densest in the entire solar system

4th Planet: Mars

- Known as "Red Planet": rich in Iron oxide (red soil)
- Second smallest planet in solar system
- Two natural moons: Phobos and Deimos
- Largest Volcano and tallest mountain of Mars: Olympus Mons

5th Planet: Jupiter

- Largest planet with shortest rotation- 10 hours
- Atmosphere filled with: Hydrogen, Helium, other gases
- Third brightest after Moon and Venus
- At present total moons: 95 moons at present
- Largest satellites: Io, Europa, Ganymede (largest among all), Callisto (all discovered by Galileo)
- Has unclear ring around it

6th Planet: Saturn

- Second largest planet
- Has bright and concentric rings made of tiny rocks, gas, dust, ice
- It is the least dense planet
- Has 146 moons at present (the maximum)
- Largest satellite: Titan
- 1655: Huygenes (discover Saturn's rings)
- 1675: Cassini (discovered gap b/w rings)

→ Cassini divisions

7th Planet: Uranus

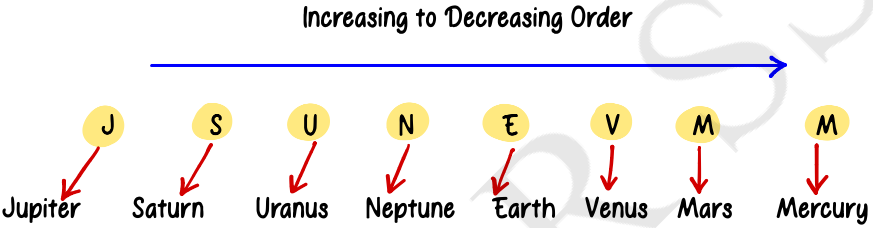
- It is greenish in colour: "Green Planet" due to presence of Methane (CH_4)
- Discovered by William Herschel in 1781
- Known as "Ice Giant"
- Atmosphere has: Hydrogen, Helium, Water, Ammonia, Methane
- Rotates clockwise like Venus
- Coldest planet
- Its is tilted to 98° at its axis- Rolling/Lopsided Planet

8th Planet: Neptune

- Farthest planet
- It is also "Ice Giant"
- Atmosphere composed of: Hydrogen, Helium
- Bluish in colour due to Methane
- Fourth largest planet and third most massive planet
- Discovered by: Johann Galle and Urbain Le Verrier in 1846 (only planet found by Mathematical Predictions)
- Has 14 satellites, famous moon: Triton

Pluto

- No more a planet in 2006 by International Astronomical Union (IAU)
- It is known as dwarf planet and is a member of Kuiper Belt
- Kuiper Belt is a spherical boundary outside the orbit of Neptune containing a number of asteroids, rocks and comets



Increasing to Decreasing Order

J S U N E V M M

Jupiter Saturn Uranus Neptune Earth Venus Mars Mercury

PARMAR SSC

SSC GK

SSC GK BATCH 2.0

Geography

Latitude – Longitude
Rotation – Revolution

Lecture :- 2

✓ For Notes Join Telegram :

Click on the icon.

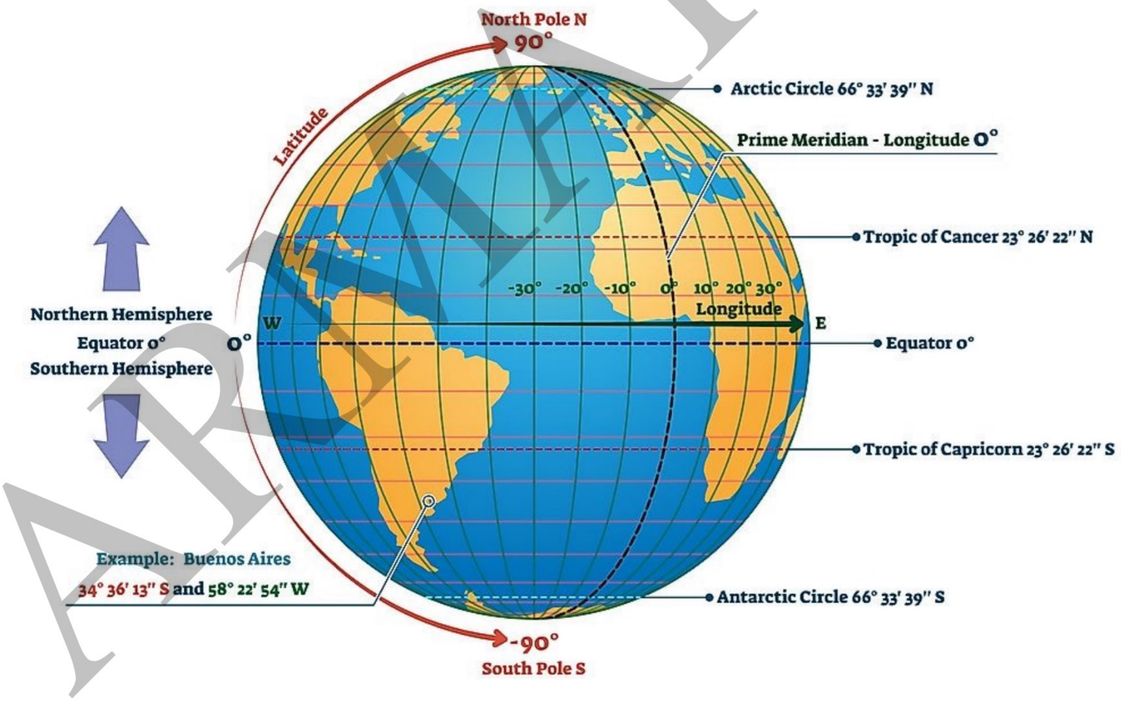
OR
Scan

✓ For Lectures Subscribe Our Parmar SSC Youtube Channel

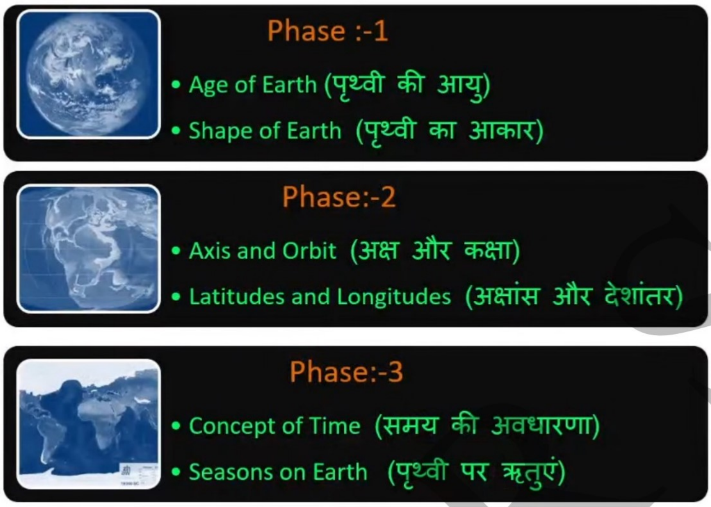
Click on the icon.

OR
Scan

LONGITUDE AND LATITUDE
ROTATION AND REVOLUTION


North Pole N
90°
Latitude
Arctic Circle 66° 33′ 39″ N
Prime Meridian - Longitude 0°
Tropic of Cancer 23° 26′ 22″ N
-30° -20° -10° 0° 10° 20° 30°
Longitude
W
E
0°
Northern Hemisphere
Equator 0°
Southern Hemisphere
Equator 0°
Tropic of Capricorn 23° 26′ 22″ S
Example: Buenos Aires
34° 36′ 13″ S and 58° 22′ 54″ W
Antarctic Circle 66° 33′ 39″ S
-90°
South Pole S

Fundamentals of Earth



Phase :-1

- Age of Earth (पृथ्वी की आयु)
- Shape of Earth (पृथ्वी का आकार)

Phase:-2

- Axis and Orbit (अक्ष और कक्षा)
- Latitudes and Longitudes (अक्षांस और देशांतर)

Phase:-3

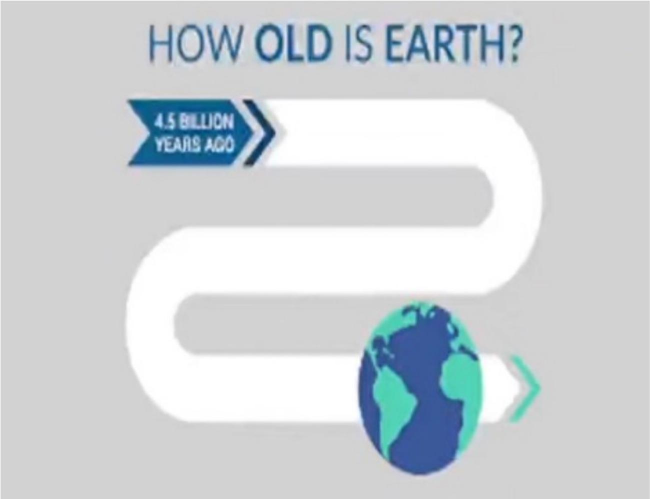
- Concept of Time (समय की अवधारणा)
- Seasons on Earth (पृथ्वी पर ऋतुएं)

Phase 4: Eclipse

Age of Earth

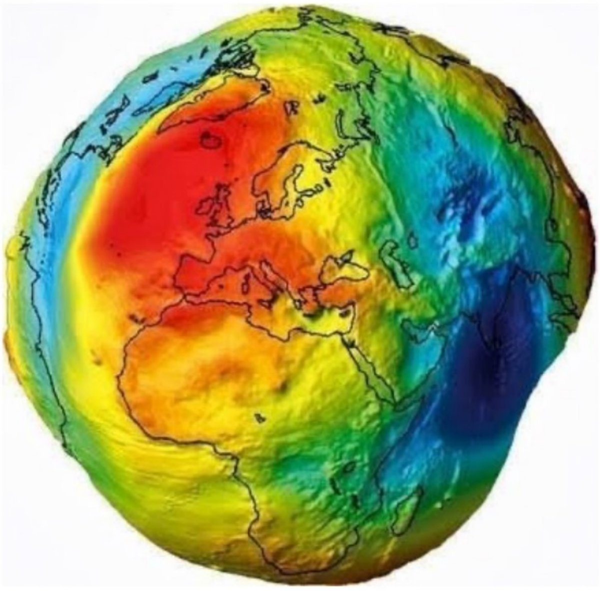
Technique used: Radioactive dating → invented by Ernst Rutherford (1905)

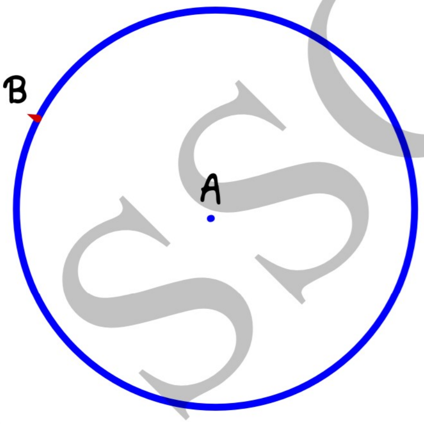
Types of Dating



1. Uranium-lead dating method (oldest rocks)
2. Potassium-argon method
3. Rubidium-strontium method
4. Radiocarbon dating method
5. Chlorine-36 dating method
6. Carbon-dating (C^{14}) (latest rocks)

Shape of Earth

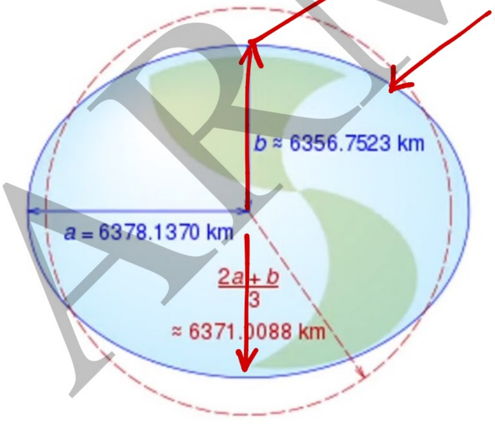


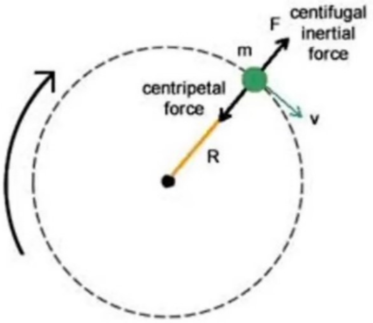


- Shape of Earth is Geoid or Oblate Spheroid (a little flat from top and bottom)
- Reason: more Centrifugal Force at Equator bulges earth at Centre and Gravitation force at poles pushes surface towards centre

due gravitational force towards the centre, it flat in top and bottom

Actual shape

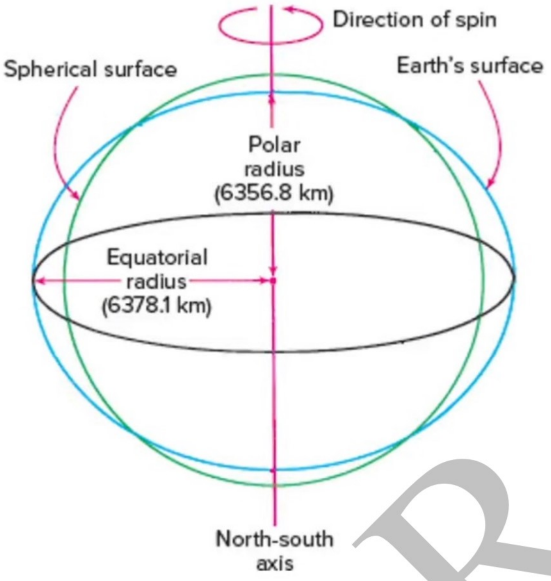

$b \approx 6356.7523$ km
$a = 6378.1370$ km
$\frac{2a+b}{3}$
≈ 6371.0088 km

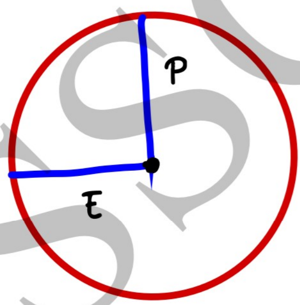

F
centifugal inertial force
m
centripetal force
v
R

When a body revolves, two types of forces is applicable

- Centripetal Force: towards the axis of rotation or centre of curvature (inside)
- Centrifugal Force: directed away from the centre of the circle

Radius of Earth


Direction of spin
Spherical surface
Earth's surface
Polar
radius
(6356.8 km)
Equatorial
radius
(6378.1 km)
North-south
axis

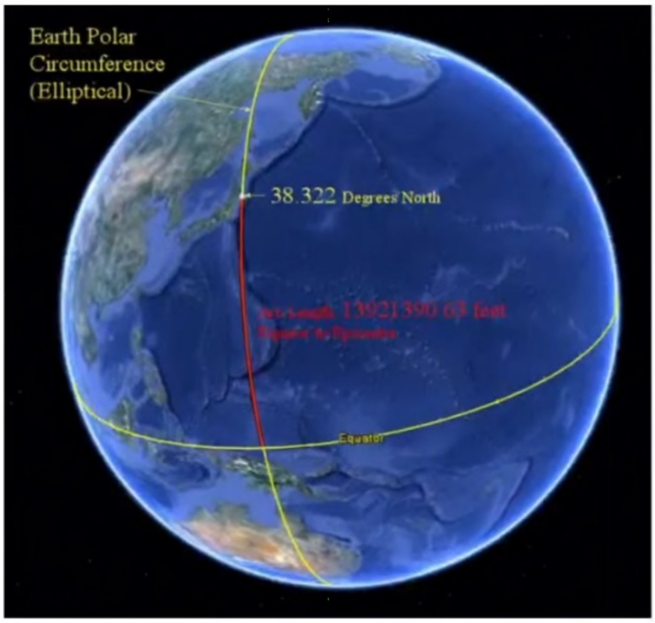


- Equatorial Radius: 6378 km
- Polar Radius: 6357 km
- Mean Radius: 6371

Why polar radius < Equatorial radius?

- Ans: Earth is bulged at the equator and flattened at the poles

Circumference of the Earth


Earth Polar
Circumference
(Elliptical)
38.322 Degrees North
Equator

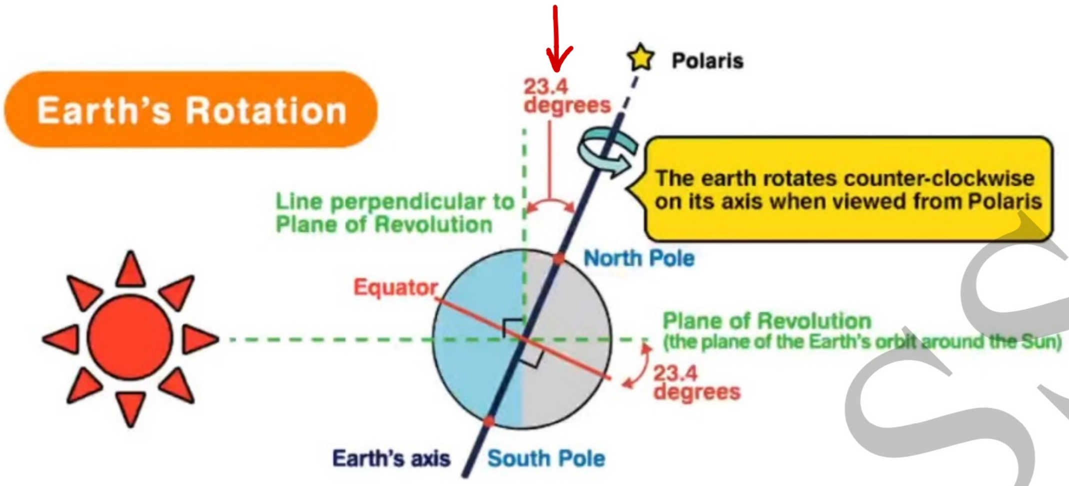
- Polar: 40,007 km
- Equatorial: 40,075 km
- Mean: 40,040 km

Why poles circumference < Equatorial?

- Earth is bulged at equator and flattened at the poles

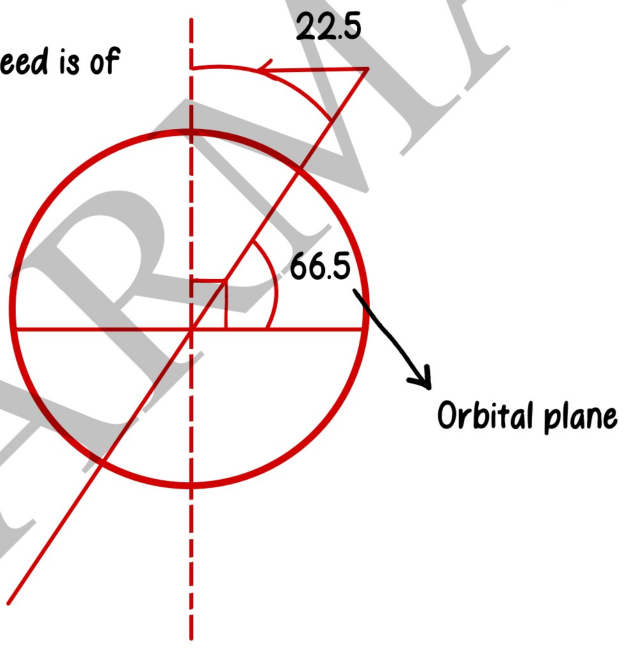
Rotation of Earth

tilted at it's axis

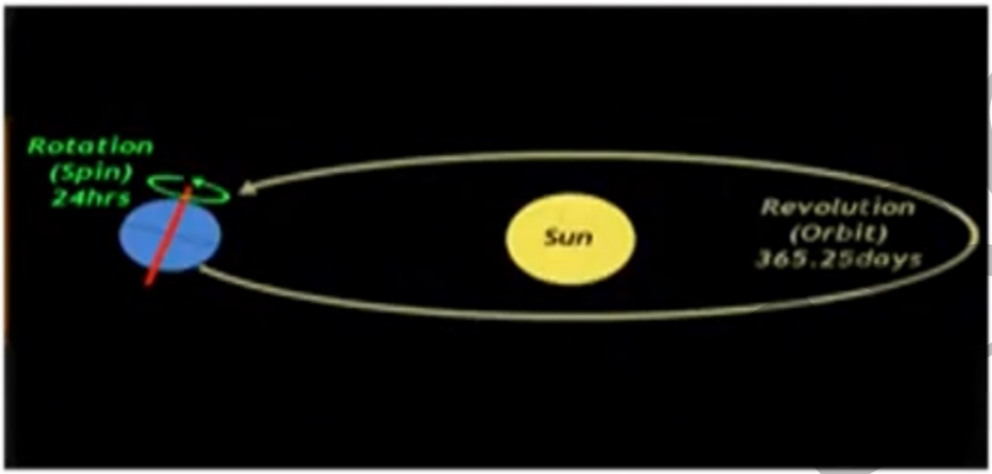

Earth's Rotation
Polaris
23.4 degrees
The earth rotates counter-clockwise on its axis when viewed from Polaris
Line perpendicular to Plane of Revolution
North Pole
Equator
Plane of Revolution (the plane of the Earth's orbit around the Sun)
23.4 degrees
Earth's axis
South Pole

- Rotation: spinning on its own axis
- One rotation of Earth: 23 hour 56 mins 4 sec
- Direction: West to East
- Rotational Speed is maximum at Equator and minimum at Poles

Fastest rotation speed is of Jupiter


22.5
66.5
Orbital plane

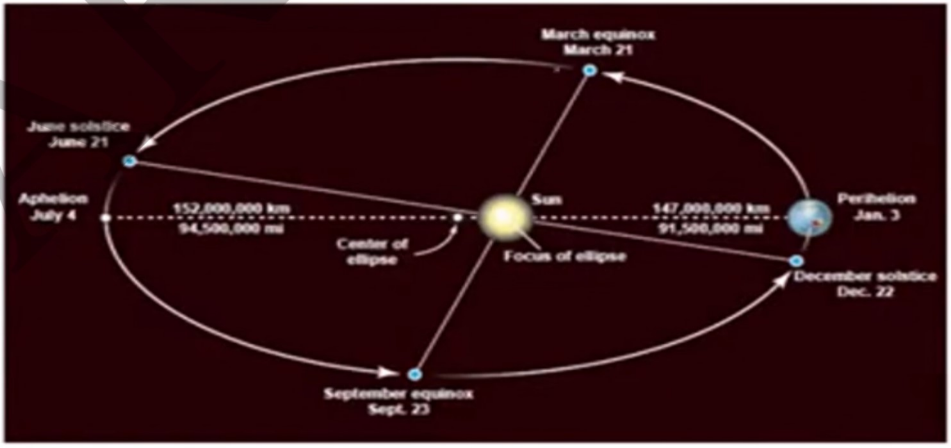
Revolution of Earth


Rotation
(Spin)
24hrs
Sun
Revolution
(Orbit)
365.25days

- Revolving around the Sun in Elliptical orbit
- One revolution: 365 days 6 hours 9 minutes and 9 sec
- Orbital speed: 29.8 km/sec
- Max orbital speed: Mercury
- Min orbital speed: Neptune

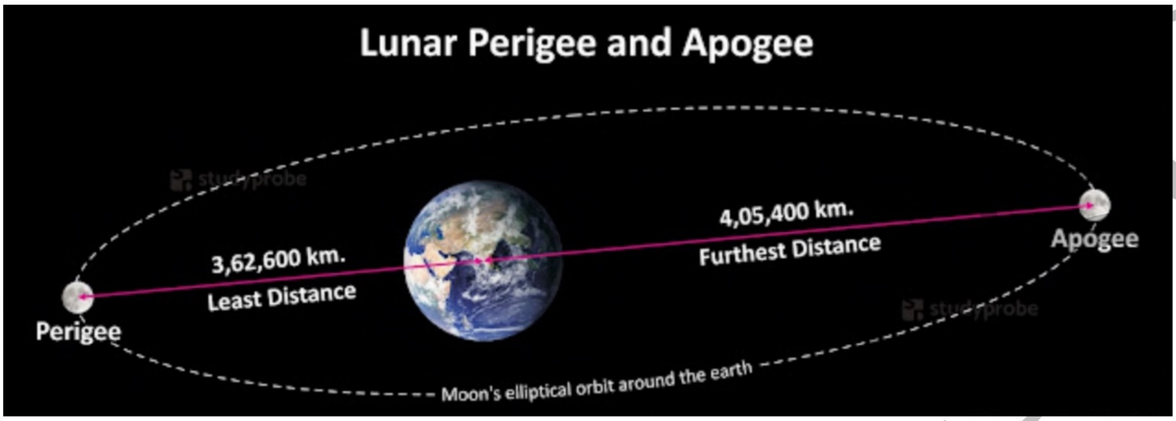
6 x 4 = 24 hrs → Leap year concept (366 days)

Distance from the Sun

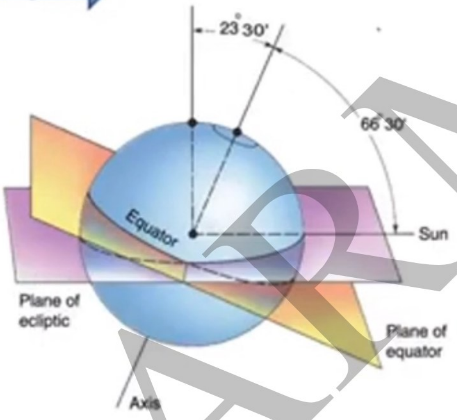

March equinox
March 21
June solstice
June 21
Aphelion
July 4
152,000,000 km
94,500,000 mi
Center of
ellipse
Sun
Focus of ellipse
147,000,000 km
91,500,000 mi
Perihelion
Jan. 3
December solstice
Dec. 22
September equinox
Sept. 23

- When nearest to Sun: Perihelion (January 3rd – 14,75,00,000 km)
- When farthest from Sun: Aphelion (July 4 – 15,25,00,000 km)

- **Perigee**: the point of moon's orbit when it is closest to Earth
- **Apogee**: When moon is farthest from Earth

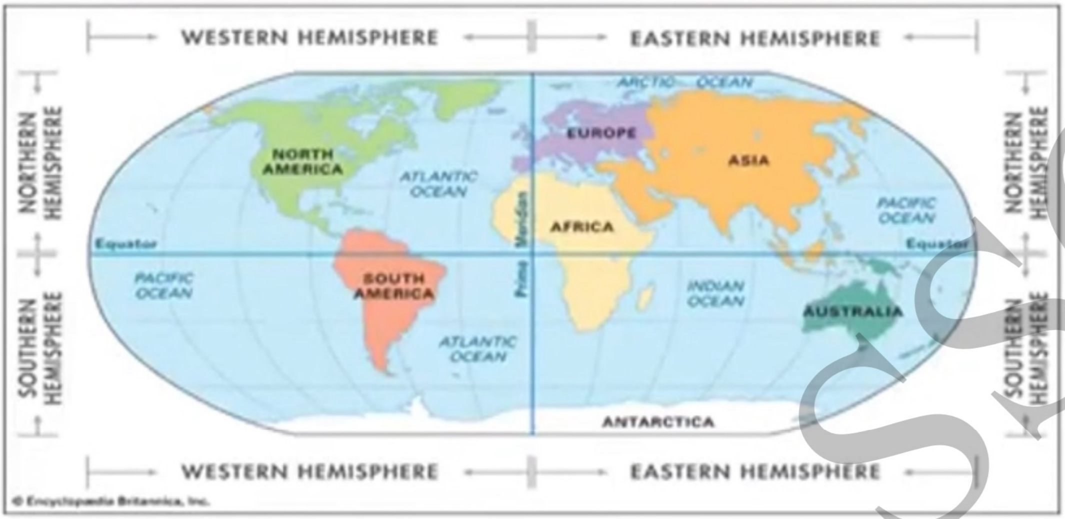

Lunar Perigee and Apogee
3,62,600 km.
Least Distance
4,05,400 km.
Furthest Distance
Perigee
Apogee
Moon's elliptical orbit around the earth
studyprobe
studyprobe

Inclination of the Earth's axis


23°30'
66°30'
Equator
Sun
Plane of ecliptic
Plane of equator
Axis

- **Axial Inclination**: Inclination of Earth on its axis = $23\frac{1}{2}^\circ$
- **Orbital Inclination**: Inclination of Earth on its orbital plane = $66\frac{1}{2}^\circ$

Hemisphere


WESTERN HEMISPHERE
EASTERN HEMISPHERE
NORTHERN HEMISPHERE
SOUTHERN HEMISPHERE
ARCTIC OCEAN
NORTH AMERICA
EUROPE
ASIA
ATLANTIC OCEAN
PACIFIC OCEAN
AFRICA
Equator
Prime Meridian
SOUTH AMERICA
INDIAN OCEAN
AUSTRALIA
ANTARCTICA
WESTERN HEMISPHERE
EASTERN HEMISPHERE
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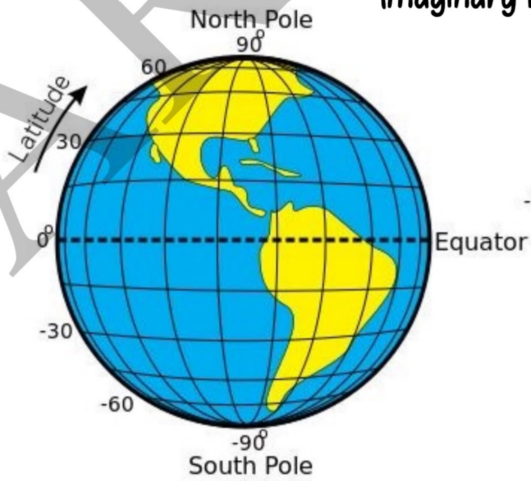
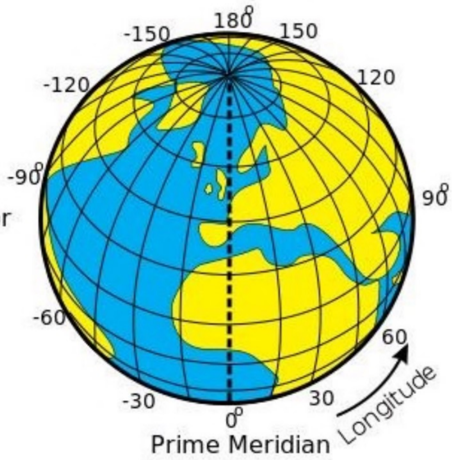
- Equal division of Earth in two parts
- Equator: divides the globe horizontally into 2 equal parts – Northern and Southern Hemisphere
- Prime Meridian and International Date Line: divides the globe vertically – Eastern and Western Hemisphere

Latitude and Longitude

↓

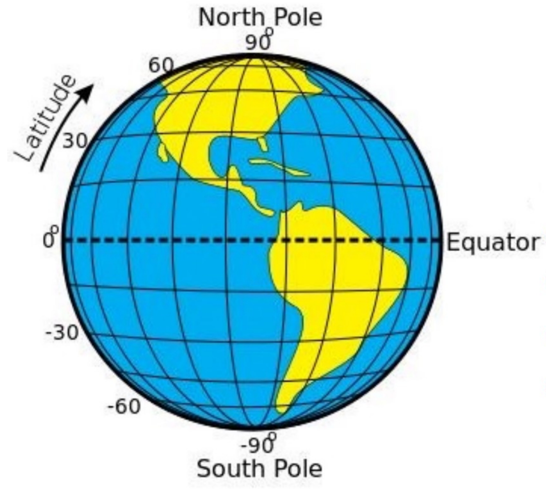
Imaginary lines


North Pole
90°
60
Latitude
30
0°
Equator
-30
-60
-90°
South Pole


-150
180°
150
-120
120
-90°
90°
-60
60
-30
30
0°
Prime Meridian
Longitude

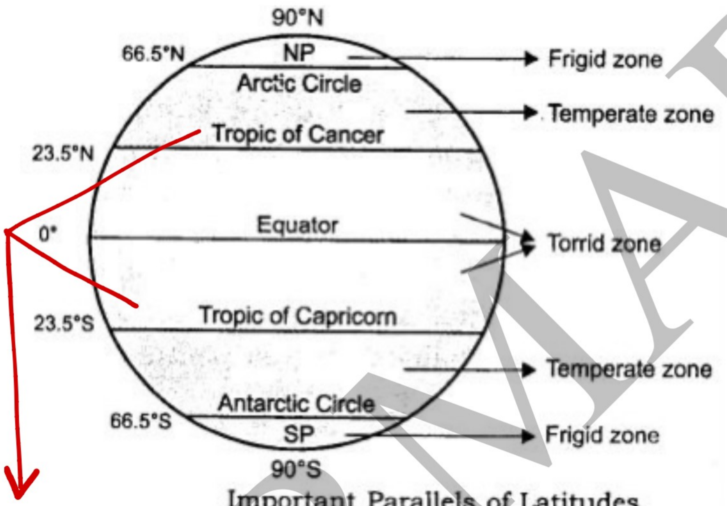
Horizontal lines

Vertical lines


North Pole
90°
60
Latitude
30
0°
Equator
-30
-60
-90°
South Pole

Latitude

- Imaginary horizontal lines on the globe that run from East to West
- Angular Distance of a place from the equator
- 1 degree of latitude = 111 km (approx)
- Total latitudes: 181
- Distance b/w each latitude is same

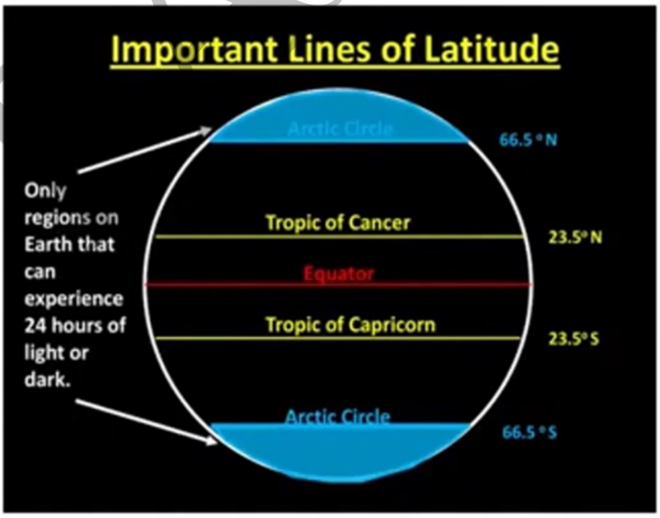

90°N
66.5°N
NP
Arctic Circle
Frigid zone
Temperate zone
Tropic of Cancer
23.5°N
0°
Equator
Torrid zone
23.5°S
Tropic of Capricorn
Temperate zone
Antarctic Circle
66.5°S
SP
Frigid zone
90°S

Important Parallels of Latitudes

Sunlight does not falls beyond these tropics

Important Latitudes:

- 0 : Equator
- $23\frac{1}{2}^\circ$N: Tropic of Cancer
- $66\frac{1}{2}^\circ$N: Arctic Circle
- $23\frac{1}{2}^\circ$S: Tropic of Capricorn
- $66\frac{1}{2}^\circ$S: Antarctic Circle
- Largest latitude: Equator
- Smallest latitude: Poles (North and South



Important Lines of Latitude

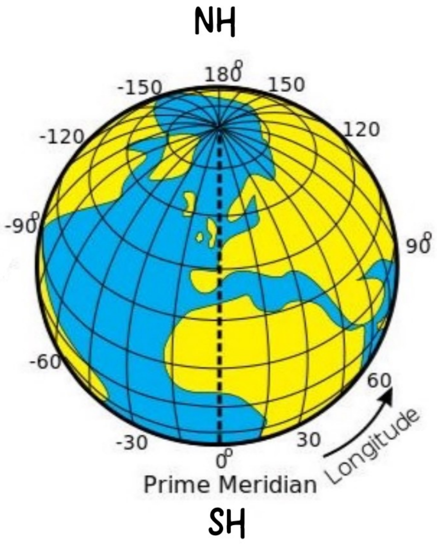
Only regions on Earth that can experience 24 hours of light or dark.

Arctic Circle
66.5°N
Tropic of Cancer
23.5°N
Equator
Tropic of Capricorn
23.5°S
Arctic Circle
66.5°S

Uses

1. In Climatology:
- Temperature zones, wind
- Responsible for Pressure System
- Planetary Winds System

2. Location of place


NH
-150
180°
150
-120
120
-90°
90°
-60
60
-30
0°
30
Longitude
Prime Meridian
SH

Longitudes

- Imaginary vertical lines over the globe that run North to South
- Angular Distance of a plane from Prime Meridian
- Distance from each longitude varies from poles towards equator
- Least distance at poles and maximum distance at equator: 111.32 km
- Total longitudes: 360

*
- All longitudes divide Earth into 2 equal parts
- All longitudes are Great Circle (circle in case of longitudes)

NORTH POLE
NORTH AMERICA
New Orleans
EUROPE
ATLANTIC OCEAN
Prime Meridian
AFRICA
SOUTH AMERICA
110°
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
0°
10°
20°
30°
40°
50°

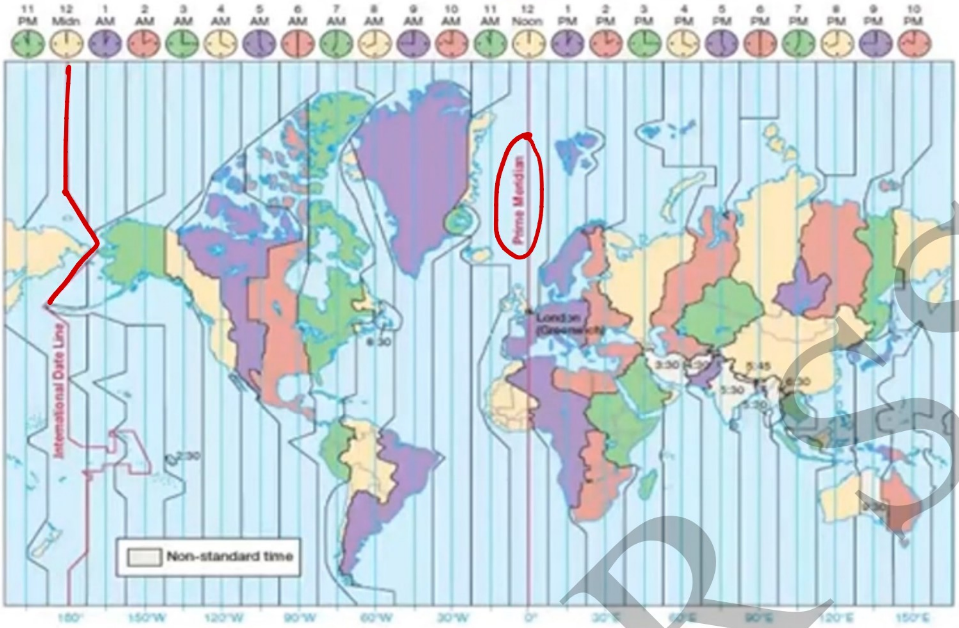
Important Meridians

- Prime Meridian: 0 degree longitude (passes from Greenwich, London)
- International Date Line: 180 degree Meridian

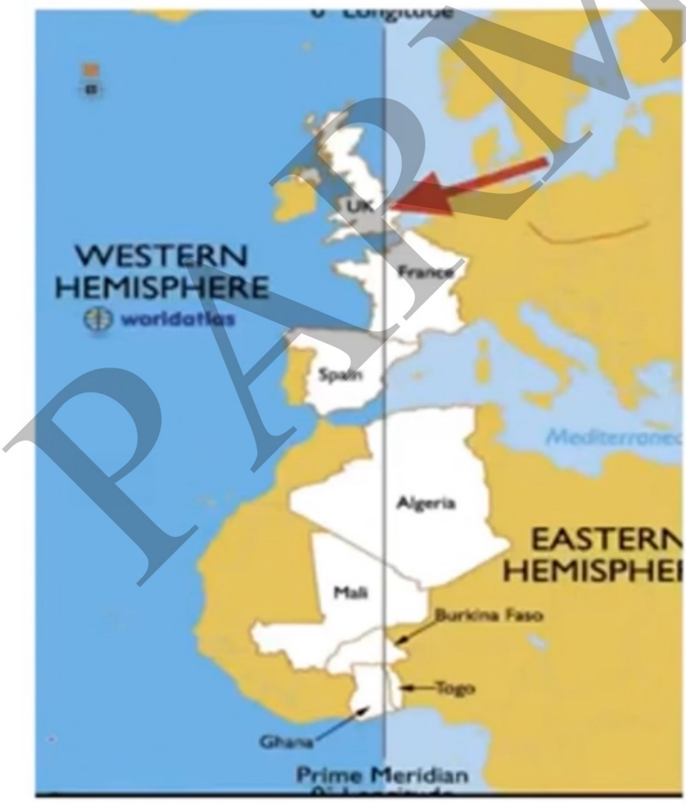
↓

Zig-Zag lines

International Date Line


11 PM
12 Midn
1 AM
2 AM
3 AM
4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
12 Noon
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
10 PM
Prime Meridian
International Date Line
London (Greenwich)
Non-standard time
180°
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E

Prime Meridian


0° Longitude
WESTERN HEMISPHERE
worldatlas
UK
France
Spain
Mediterranean
Algeria
EASTERN HEMISPHERE
Mali
Burkina Faso
Togo
Ghana
Prime Meridian
0° Longitude

- It passes through Greenwich in London
- Countries: 8

UK
France
Spain
Algeria
Mali
Burkina Faso
Togo
Ghana

- TRICK: BSF GAMe in TOGO Kingdom

12
1
2
3
4
5
6
7
8
9
10
11

$360^\circ = 24$ hrs

$\frac{360^\circ}{24} = 1$ hr

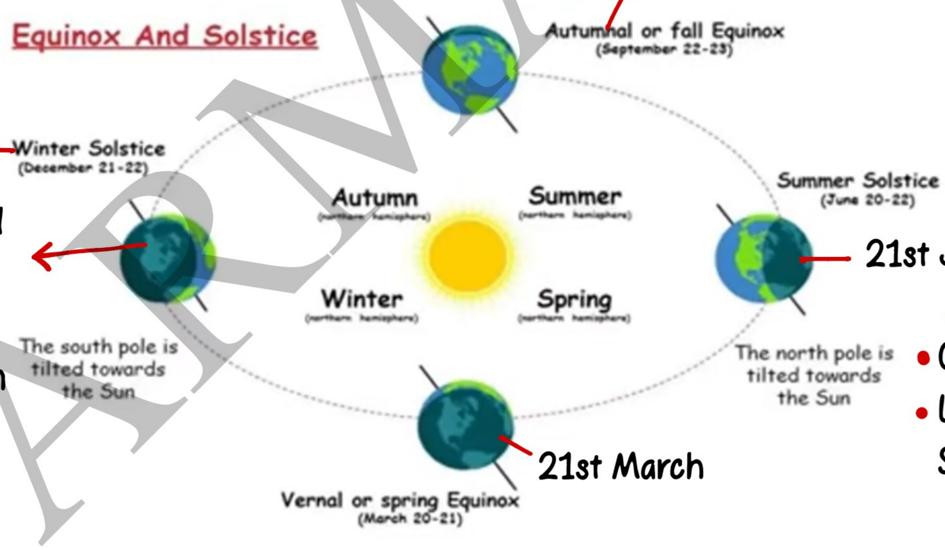
$15^\circ = 1$ hr

$15^\circ = 60$ mins

$1^\circ = \frac{60}{15} = 4$ mins

- Prime Meridian will increase the time by 1 hr
- Moving each 15° towards West of Prime
- Meridian will decrease the time by 1 hr

Solstice and Equinox


Equinox And Solstice
Autumnal or fall Equinox
(September 22-23)
Winter Solstice
(December 21-22)
Summer Solstice
(June 20-22)
Autumn
(northern hemisphere)
Summer
(northern hemisphere)
Winter
(northern hemisphere)
Spring
(northern hemisphere)
The south pole is tilted towards the Sun
The north pole is tilted towards the Sun
Vernal or spring Equinox
(March 20-21)

23rd Sep

22nd Dec

Overhead Rays in Tropic of Capricorn

21st June

- Overhead Rays
- Longest day and Shortest night

21st March

- Day and Night: due to Rotation
- Seasons:
  1. Revolution
  2. Tilt

Solstice

Summer – June 21

1. Vertical rays on Tropic of Cancer
2. Northern Hemisphere gets more heat
3. Continuous sun rays on North Pole for 6 months, continuous days
4. known as Kark Sankranthi

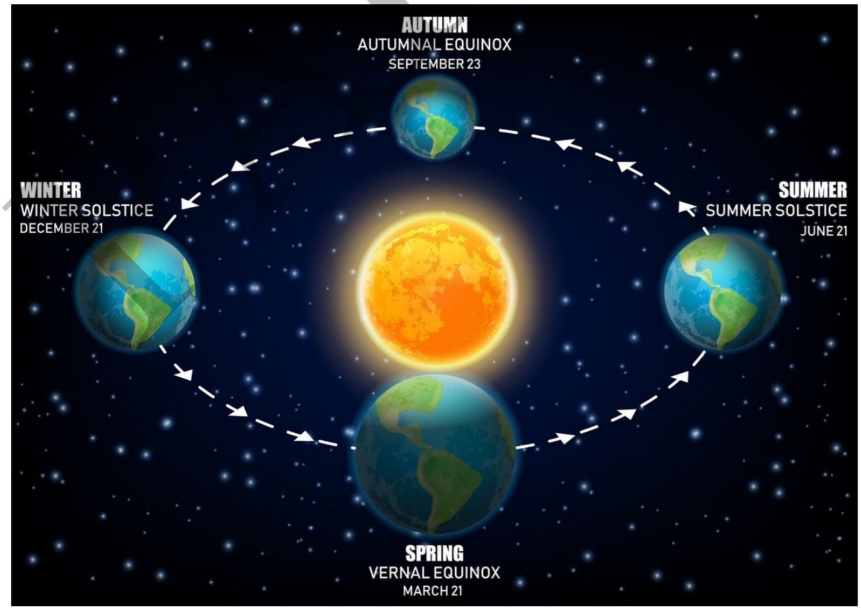
Insolation: incoming solar radiations

Winter – Dec 22

1. Vertical rays on Tropic of Capricorn
2. Southern Hemisphere gets more heat
3. Continuous Sun rays on South Pole for 6 months, continuous daylight
4. known as Makar Sankranthi

Equinox

- Direct rays of the Sun fall on the Equator
- At this position neither of the poles is titled towards the Sun
- So, the entire Earth experiences Equal days and nights

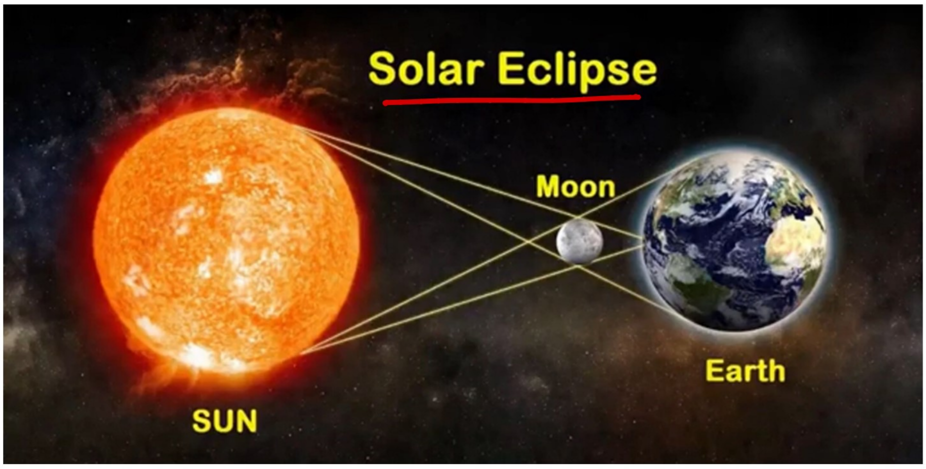

AUTUMN
AUTUMNAL EQUINOX
SEPTEMBER 23
WINTER
WINTER SOLSTICE
DECEMBER 21
SUMMER
SUMMER SOLSTICE
JUNE 21
SPRING
VERNAL EQUINOX
MARCH 21

Vernal Equinox

- March 21: It is spring in the NH and autumn in the SH

Autumnal Equinox

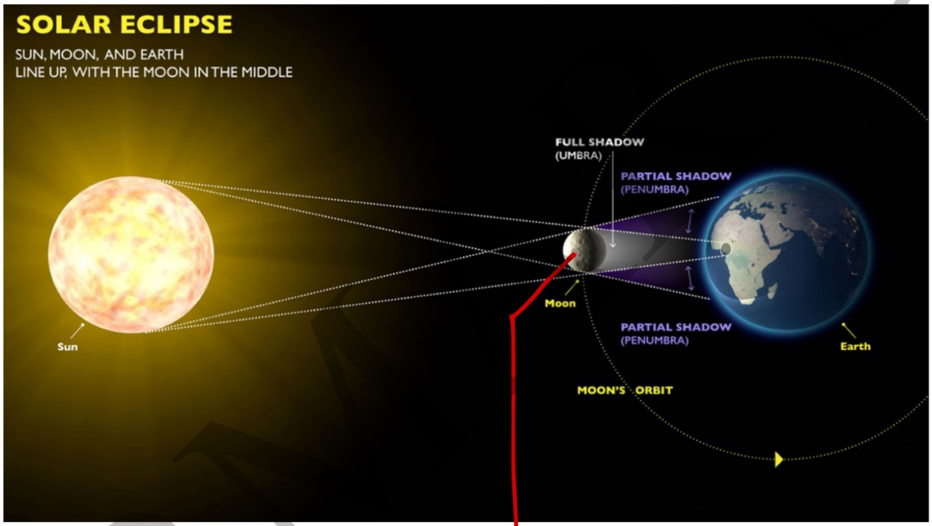
- Sep 23: it is autumn in NH and spring in SH


Solar Eclipse
Moon
Earth
SUN

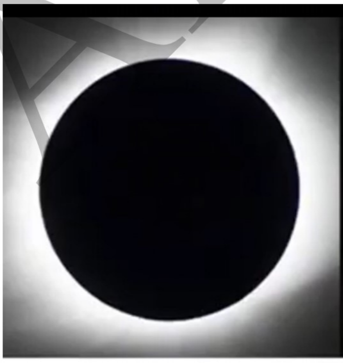
- Sun (at its constant position) is obscured by the moon

↓

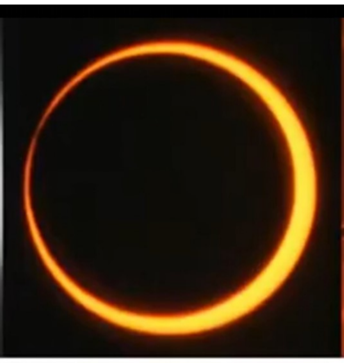
New Moon
- Amavasya


SOLAR ECLIPSE
SUN, MOON, AND EARTH LINE UP, WITH THE MOON IN THE MIDDLE
FULL SHADOW (UMBRA)
PARTIAL SHADOW (PENUMBRA)
Sun
Moon
Earth
PARTIAL SHADOW (PENUMBRA)
MOON'S ORBIT

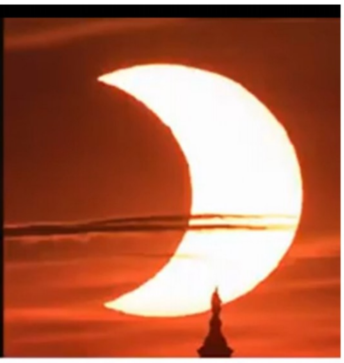
Moon is blocking Sun's light



Total Solar Eclipse

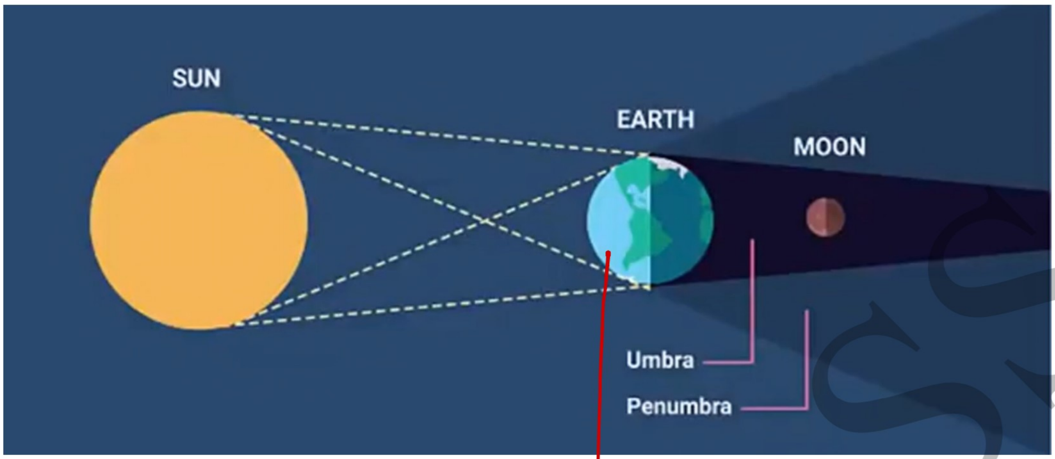


Annular Solar Eclipse



Partial Solar Eclipse

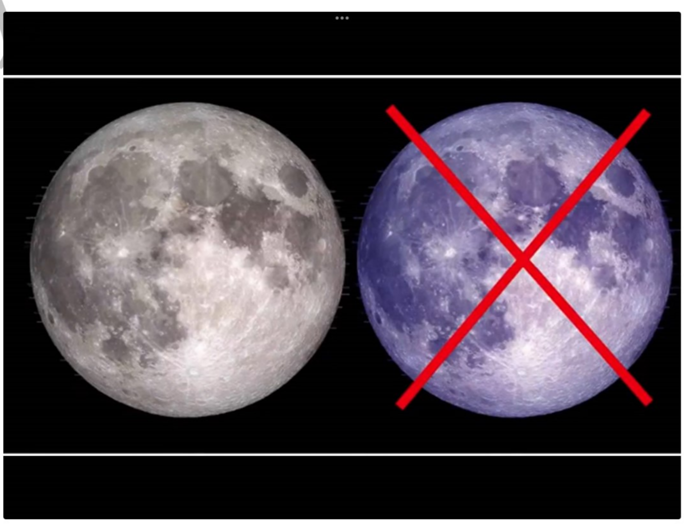
Lunar Eclipse


SUN
EARTH
MOON
Umbra
Penumbra

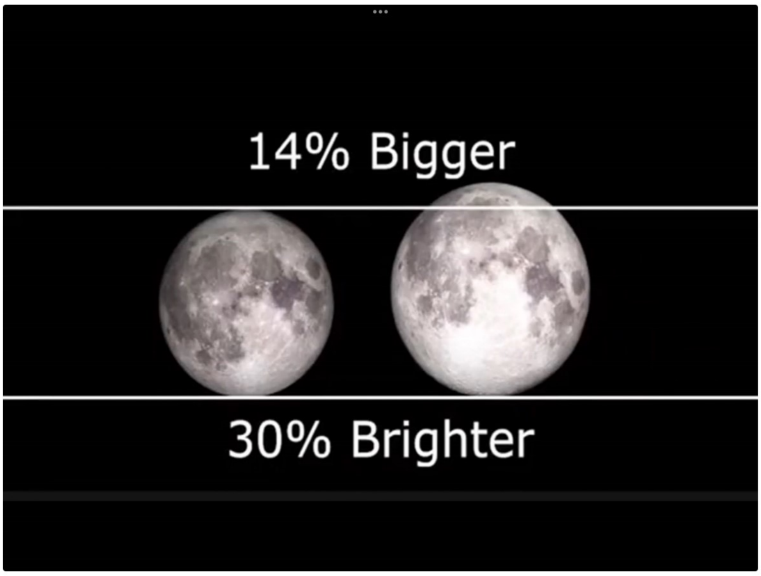
- Full Moon condition- Purnima

Earth blocks Sun's light
(light refraction) → scatters more
causing blue colour
light to vanish and red → scatters less
light to reach moon

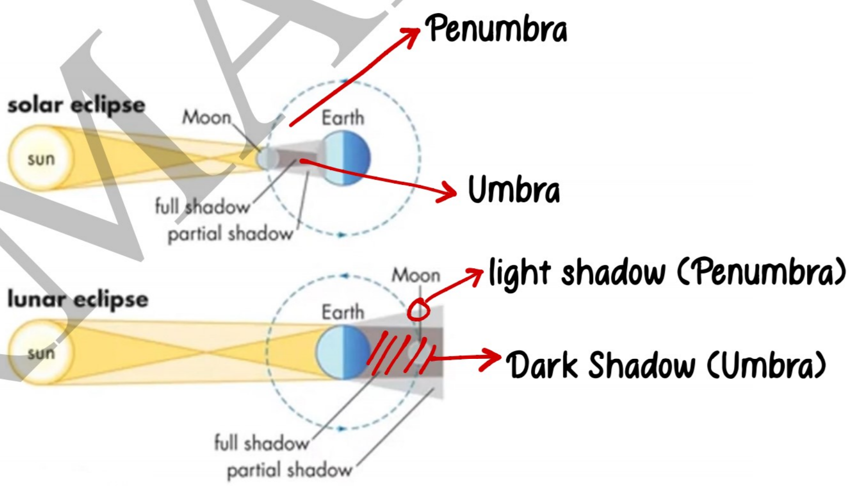
Red Moon



Blue moon
↓
2 full moon in a month


14% Bigger
30% Brighter

- Lunar Eclipse + Perigee → Moon appears bigger than its normal size
  ↓
  Super Moon condition


solar eclipse
sun
Moon
Earth
full shadow
partial shadow
lunar eclipse
sun
Moon
Earth
full shadow
partial shadow

Penumbra

Umbra

light shadow (Penumbra)

Dark Shadow (Umbra)

PARMAR
SSC

SSC GK

PARMAR'S GK BATCH

Geography

Earth’s Interior and Plate Tectonics

Lecture :- 3

✓ For Notes Join Telegram :

Click on the icon.

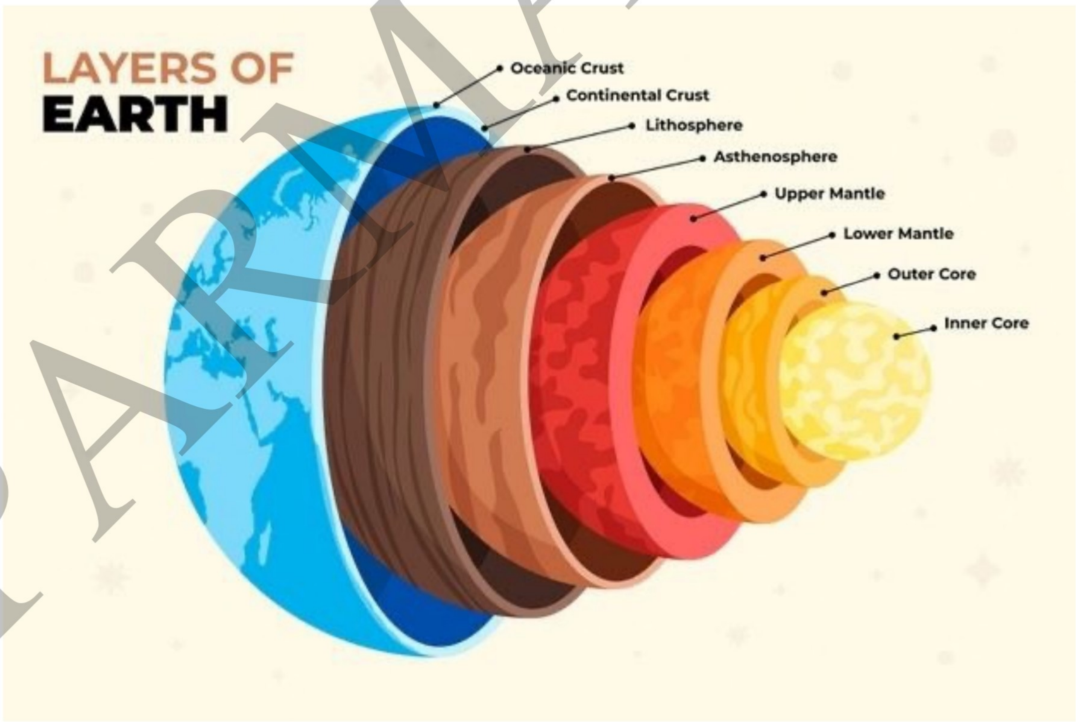
OR
Scan

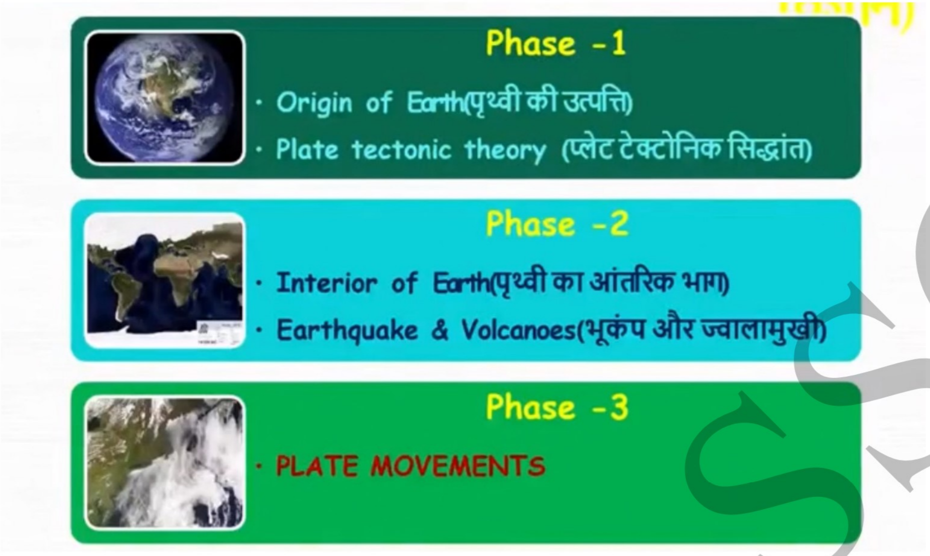
✓ For Lectures Subscribe Our Parmar SSC Youtube Channel

Click on the icon.

OR
Scan

Earth's Interior
&
Plate Tectonic


LAYERS OF EARTH
Oceanic Crust
Continental Crust
Lithosphere
Asthenosphere
Upper Mantle
Lower Mantle
Outer Core
Inner Core



Phase -1

- Origin of Earth(पृथ्वी की उत्पत्ति)
- Plate tectonic theory (प्लेट टेक्टोनिक सिद्धांत)

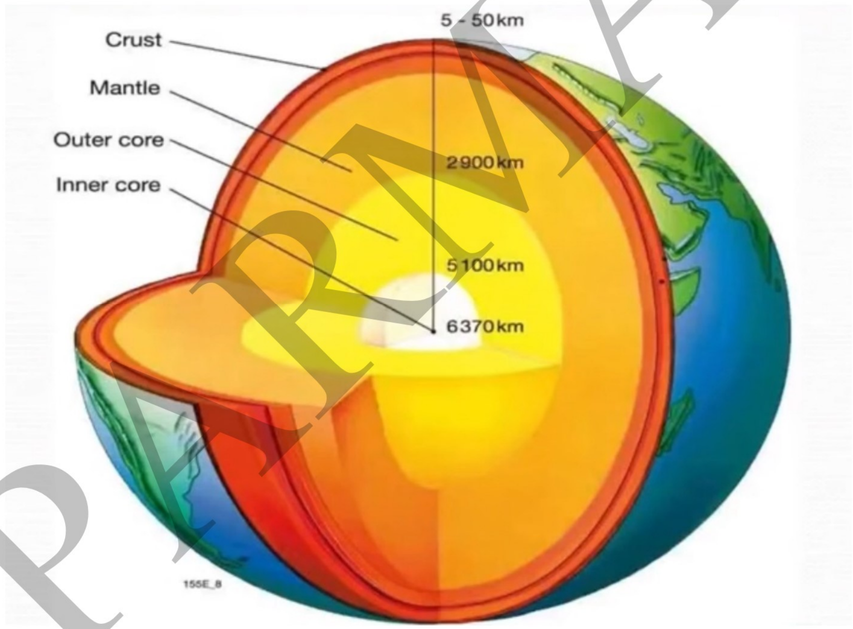
Phase -2

- Interior of Earth(पृथ्वी का आंतरिक भाग)
- Earthquake & Volcanoes(भूकंप और ज्वालामुखी)

Phase -3

- PLATE MOVEMENTS

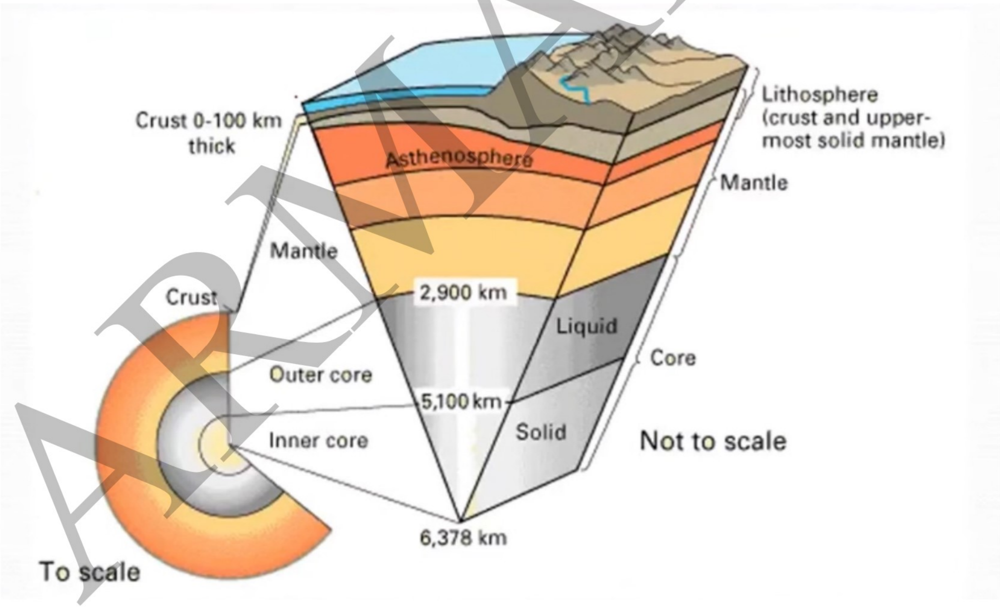
Earth's Interior

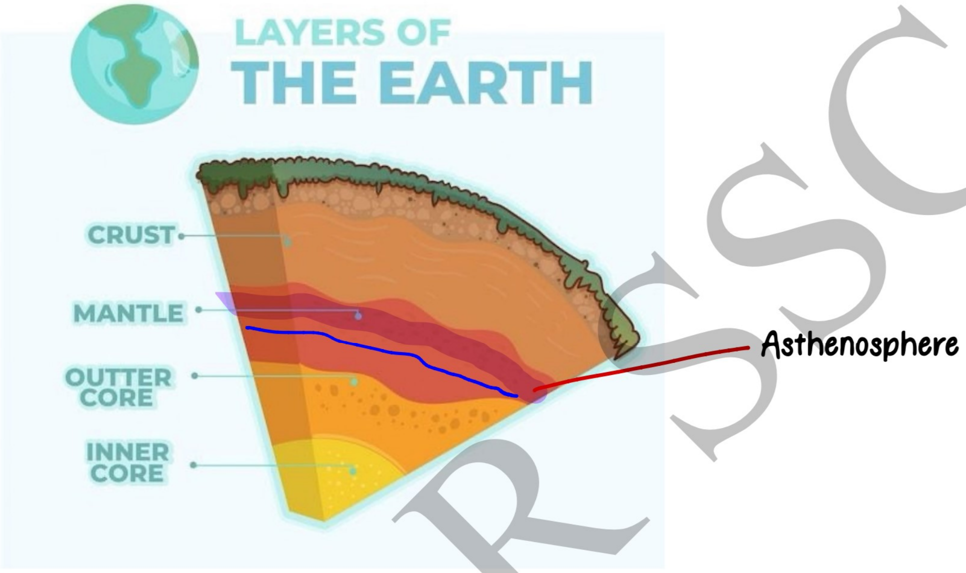

Crust
Mantle
Outer core
Inner core
5 - 50 km
2900 km
5100 km
6370 km
155E_8

Four method's to know Earth's interior:

1. Temperature – indirect source
2. Volcanoes and rock – direct source
3. Meteorites – indirect source
4. Earthquakes – indirect source

Temperature
Volcanoes
Meteorites
Earthquakes


Crust 0-100 km thick
Lithosphere (crust and upper-most solid mantle)
Asthenosphere
Mantle
Mantle
Crust
2,900 km
Liquid
Core
Outer core
5,100 km
Inner core
Solid
Not to scale
6,378 km
To scale


LAYERS OF
THE EARTH
CRUST
MANTLE
OUTTER CORE
INNER CORE
Asthenosphere

Crust: made of Silica and Aluminium layer (SiAl)

- Thickness: 5–70 km

Two divisions:

1. Continental Crust:

- land part of crust
- 30 km (thick/lighter)
- made of Granitic rock

2. Oceanic Crust:

- water part of crust
- 5 km (thick/denser)
- made of Basaltic rock

Composition of Earth's crust:

- O → 46.4%
- Si → 28%
- Al → 8% (most abundant metal in crust)
- Fe → 5% (2nd most abundant)

Mantle: made of Silica and Magnesium (SiMa)

- Thickness: 2900 km
- Top layer: Solid form

Two divisions:

1. Upper Mantle
2. Lower Mantle

- Asthenosphere: semi-molten form (plastic form)

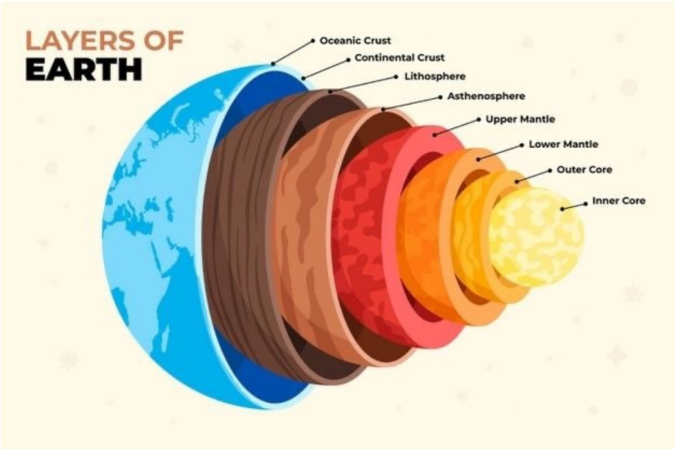
Core: made of Nickel and Iron (NiFe)

Two divisions:

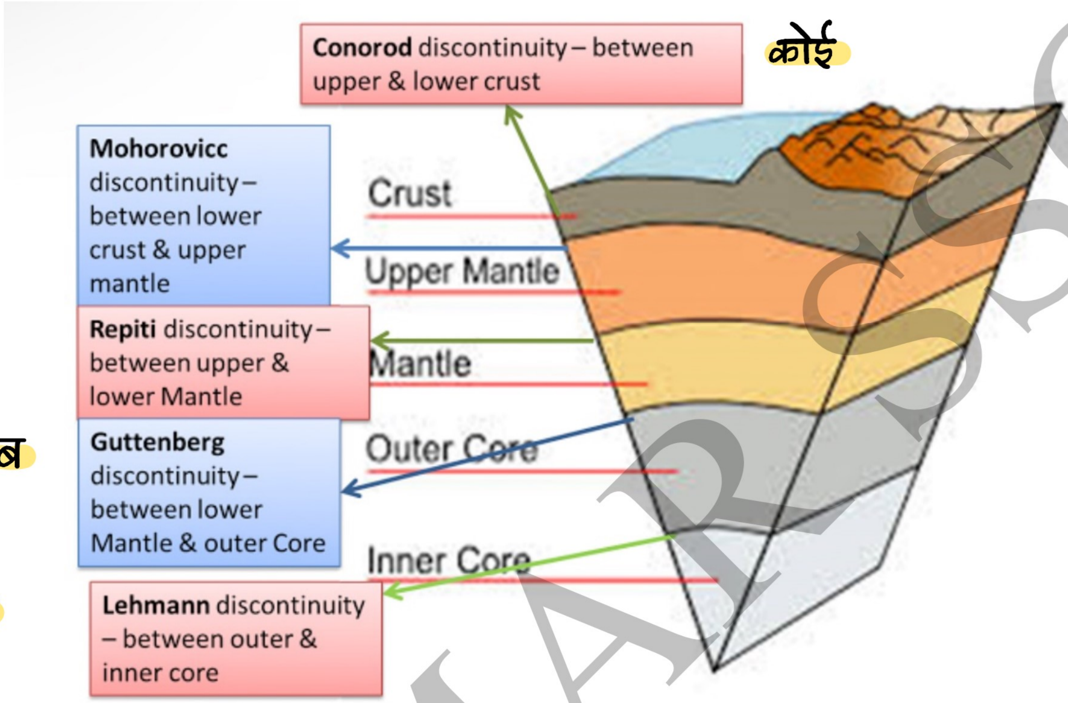
1. Inner Core: Solid form - 2200 km
2. Outer Core: liquid form (shows magnetic properties) - 1300 km

	Crust	Mantle	Core
By Volume	1%	84%	15%
By Mass	1%	68%	31%

- Lithosphere: Crust + Upper solid part of Mantle - thickness: 10-200 km
- Asthenosphere is not part of Lithosphere


LAYERS OF EARTH
Oceanic Crust
Continental Crust
Lithosphere
Asthenosphere
Upper Mantle
Lower Mantle
Outer Core
Inner Core

Earth's Discontinuity


Conorod discontinuity – between upper & lower crust
Mohorovicc discontinuity – between lower crust & upper mantle
Crust
Upper Mantle
Repiti discontinuity – between upper & lower Mantle
Mantle
Guttenberg discontinuity – between lower Mantle & outer Core
Outer Core
Inner Core
Lehmann discontinuity – between outer & inner core

कोई

मुझे

Red

गुलाब

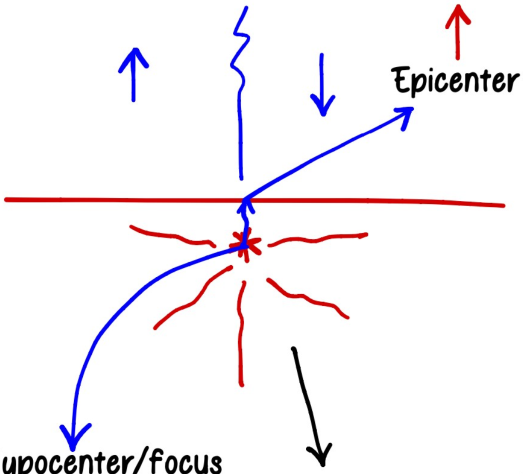
लादो

S. No	Discontinuity	Layers	Depth
1.	Conrad	Outer and Inner Crust	45 km
2.	Moho	Crust and Mantle Inner Crust and Outer Mantle Inner Crust and Asthenosphere	100 km
3.	Repiti	Outer Mantle and Inner Mantle	700 km
4.	Gutenberg-Weichart	Mantle and Core Inner Mantle and Outer Core	2900 km
5.	Lehmann	Outer Core and Inner Core	5200 km

Earthquake

- An Earthquake is intense shaking of Earth's surface, which causes shifting of Earth's plate

Distance nearest to Epicenter = more destruction



Hypocenter/focus
(Place from
where energy is
released first)

Energy released due to movement of plates on the form of waves

↓

Earthquake/Seismic waves

- Seismograph: an instrument that records earthquake waves

Waves

Body Waves → Surface Waves/Love waves

Rocks

4-6 km/sec

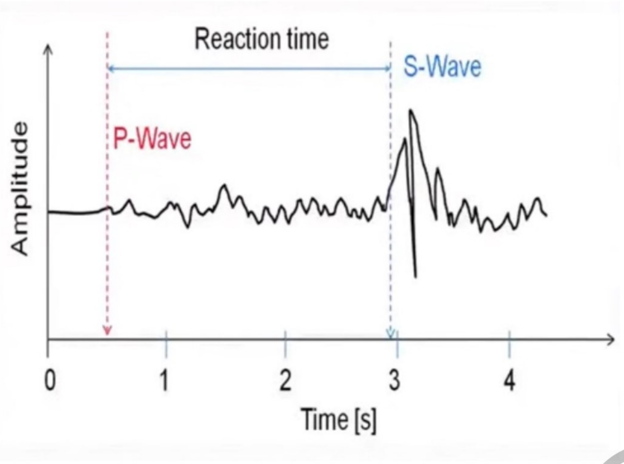
Surface Waves/Love waves ↓ causes more destruction

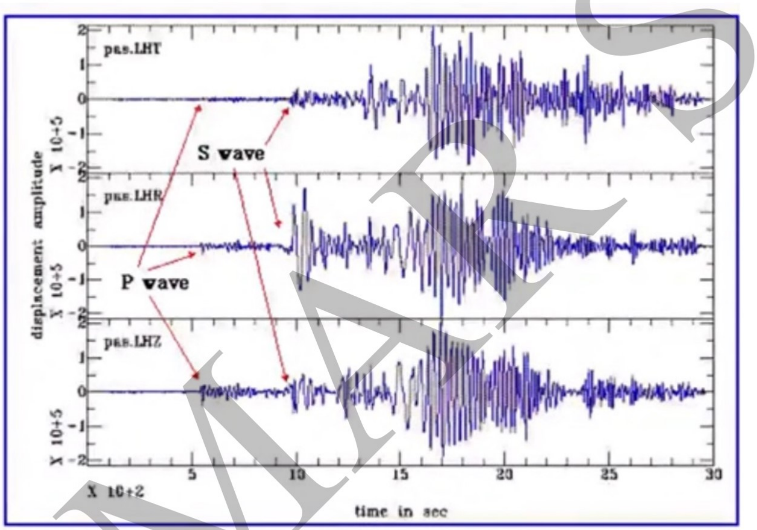
P waves
- Travels fastest
- Longitudinal

Speed ratio:
- Solid > Liquid > Gas (through all mediums)
- They resemble Sound Waves

- First to reach on surface
- 7-8 km/sec

S waves
- Transverse
- Can travel only in Solid medium





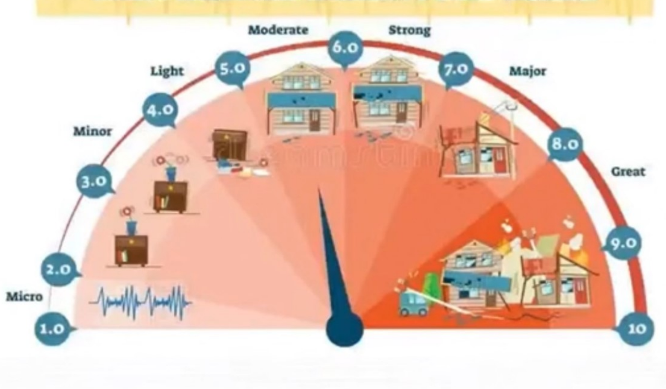
S waves

- creates Crest and Trough

P waves

- creates Compression and Rarefaction
- causes stretching and squeezing

Scales to measure Earthquake


EARTHQUAKE MAGNITUDE SCALE
Micro
Minor
Light
Moderate
Strong
Major
Great
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10

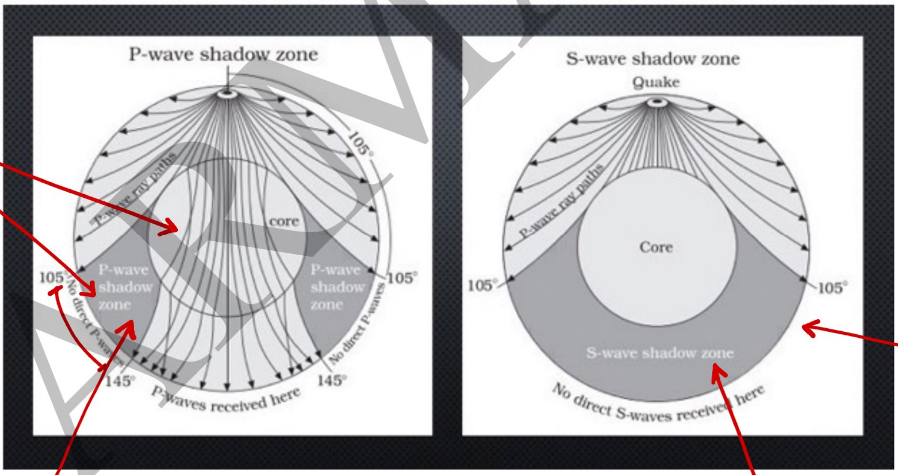
Richter Scale

- Instrument to measure magnitude of Earthquake
- Magnitude: 0-10
- It is a limitless scale

Mercalli Scale

- Instrument to measure intensity of Earthquake
- Magnitude: 1-11

Shadow zone of waves


P-wave shadow zone
105°
P-wave ray paths
core
P-wave shadow zone
P-wave shadow zone
105°
105°
No direct P-waves
No direct P-waves
145°
145°
P-waves received here
S-wave shadow zone
Quake
P-wave ray paths
Core
105°
105°
S-wave shadow zone
No direct S-waves received here

speed slow

Liquid medium

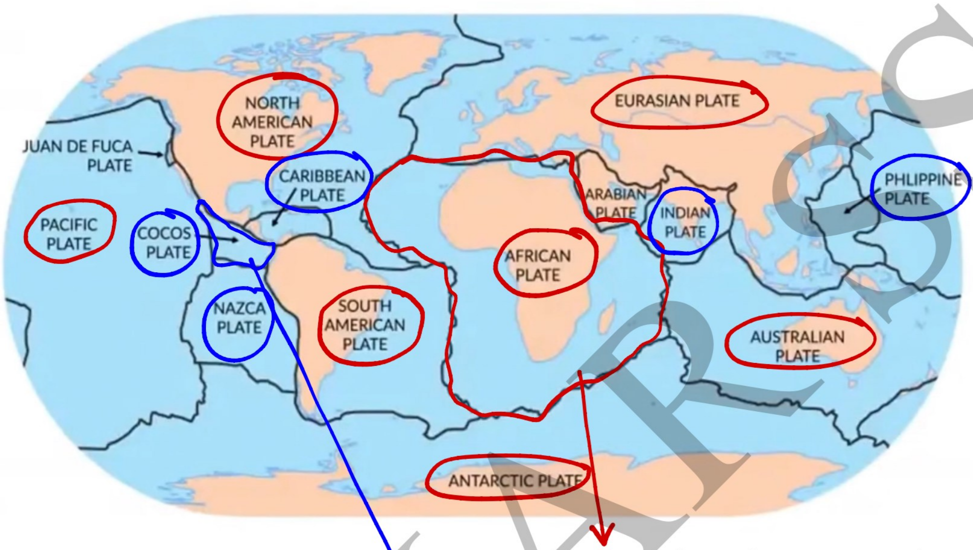
Liquid medium

Large shadow zone

- 40% of Earth's surface (not recorded)

Tectonic plates

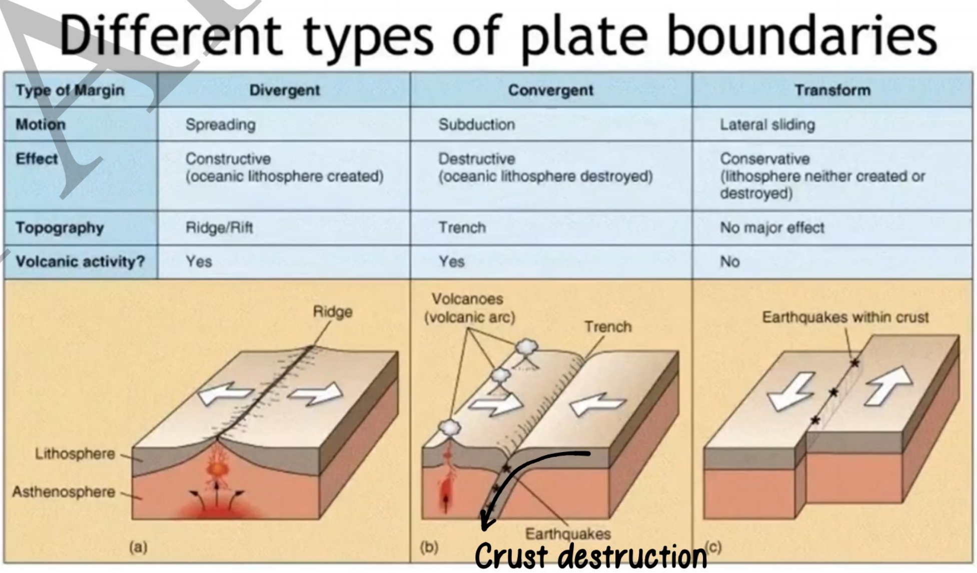
- Lithosphere makes plates comprising Crust and upper solid part of Mantle
- 7 Major + few minor plates


NORTH AMERICAN PLATE
EURASIAN PLATE
JUAN DE FUCA PLATE
CARIBBEAN PLATE
PHLIPPINE PLATE
ARABIAN PLATE
INDIAN PLATE
PACIFIC PLATE
COCOS PLATE
AFRICAN PLATE
NAZCA PLATE
SOUTH AMERICAN PLATE
AUSTRALIAN PLATE
ANTARCTIC PLATE

Large boundary: major plate

Minor boundary: minor plate

- Major plates marked in red
- Minor plates marked in blue

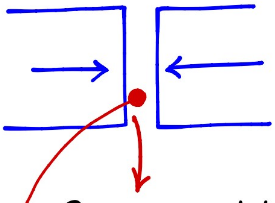


Different types of plate boundaries

Type of Margin	Divergent	Convergent	Transform
Motion	Spreading	Subduction	Lateral sliding
Effect	Constructive (oceanic lithosphere created)	Destructive (oceanic lithosphere destroyed)	Conservative (lithosphere neither created or destroyed)
Topography	Ridge/Rift	Trench	No major effect
Volcanic activity?	Yes	Yes	No

Ridge
Lithosphere
Asthenosphere
(a)
Volcanoes (volcanic arc)
Trench
Earthquakes
(b)
Crust destruction
Earthquakes within crust
(c)

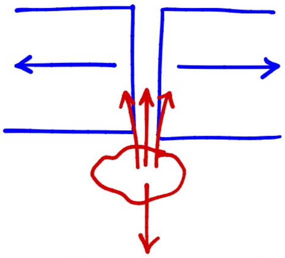
Convergent



Denser one subducts

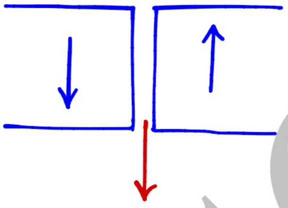
Subduction zone created
Asthenosphere melts
the crust causing crust
destruction

Divergent



distance created, causing lava to
explode
New crust formation -
Constructive boundary

Conservative



Lateral Sliding
Conservative boundary

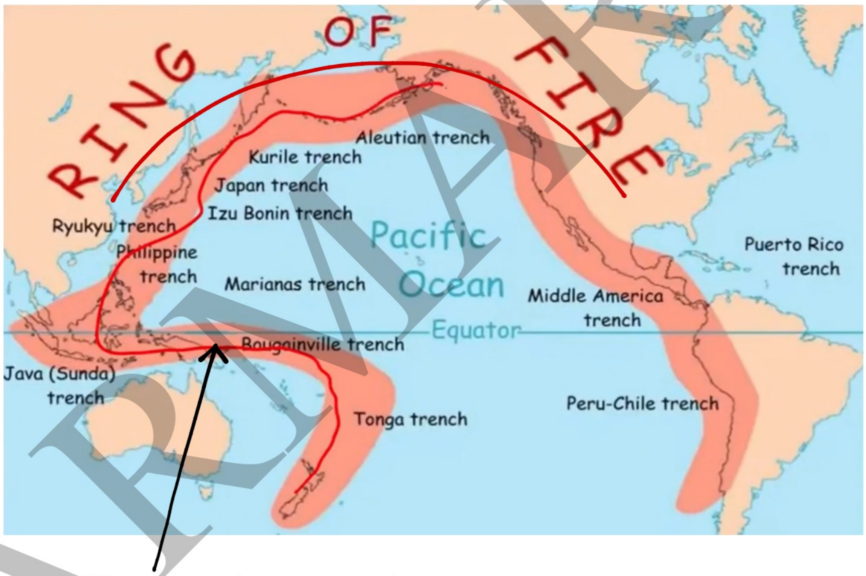
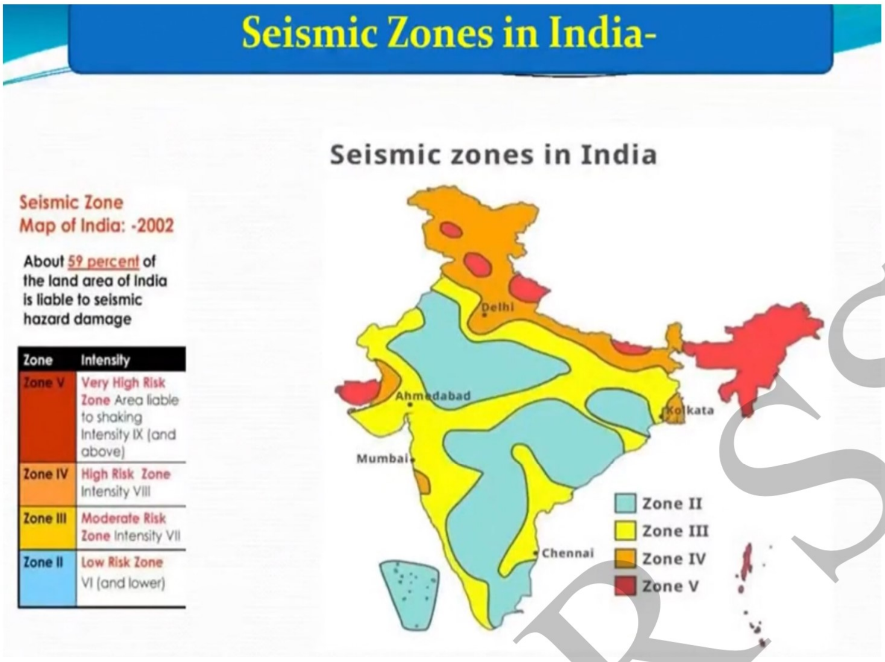

RING OF FIRE
Aleutian trench
Kurile trench
Japan trench
Izu Bonin trench
Ryukyu trench
Philippine trench
Marianas trench
Pacific Ocean
Puerto Rico trench
Middle America trench
Equator
Bougainville trench
Java (Sunda) trench
Tonga trench
Peru-Chile trench

Plate boundary created,
these places are called-
Ring of Fire in Pacific
Ocean

Force behind plate movement:

- Heat generated within the Earth due to Radioactive decay and Residual heat



Seismic Zones in India-

Seismic Zone
Map of India: -2002

About 59 percent of the land area of India is liable to seismic hazard damage

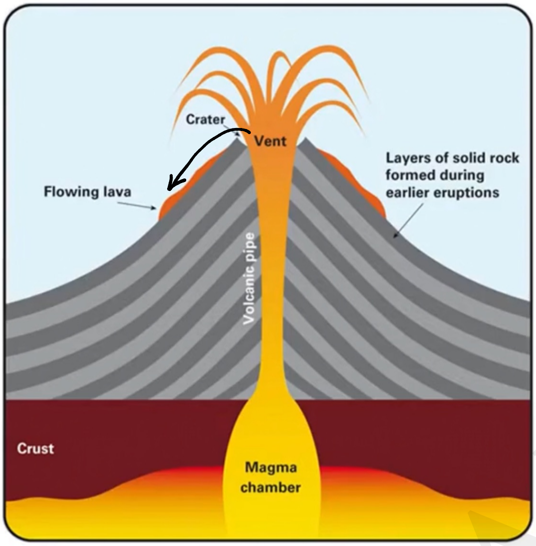
Zone	Intensity
Zone V	Very High Risk Zone Area liable to shaking Intensity IX (and above)
Zone IV	High Risk Zone Intensity VIII
Zone III	Moderate Risk Zone Intensity VII
Zone II	Low Risk Zone VI (and lower)

Seismic zones in India

Delhi
Ahmedabad
Kolkata
Mumbai
Chennai
🟦 Zone II
🟨 Zone III
🟧 Zone IV
🟥 Zone V

ROCKS, CONTINENT AND OCEANS

Petrology: Study of rocks

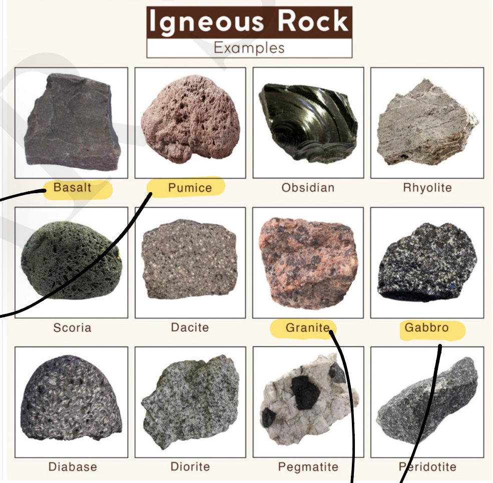

Crater
Vent
Flowing lava
Layers of solid rock formed during earlier eruptions
Volcanic pipe
Crust
Magma chamber

How are rocks formed?

Igneous Rocks: formed when magma cools and solidifies

Types:

1. Intrusive: solidifies inside
2. Extrusive: solidifies outside

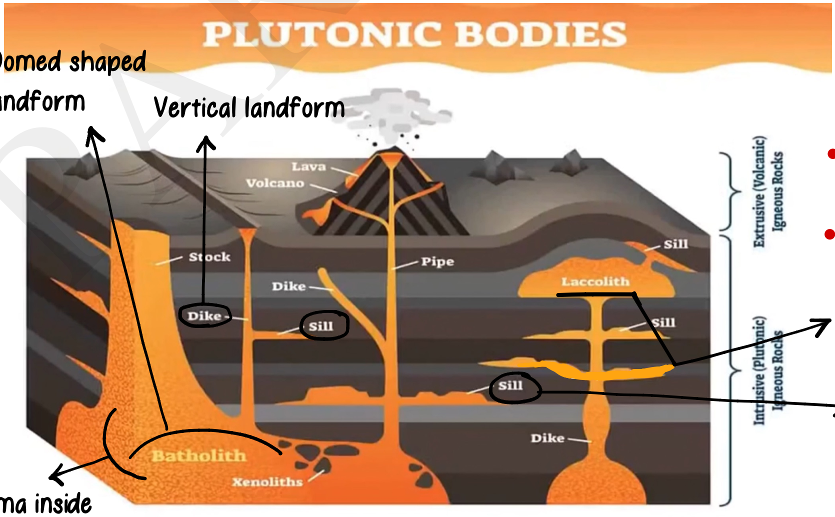

Igneous Rock
Examples
Basalt
Pumice
Obsidian
Rhyolite
Scoria
Dacite
Granite
Gabbro
Diabase
Diorite
Pegmatite
Peridotite

Extrusive igneous rock

Intrusive igneous rock/plutonic rocks

Rock

Exogenous agents act upon
eg: wind, water


PLUTONIC BODIES
Lava
Volcano
Stock
Pipe
Dike
Sill
Laccolith
Sill
Dike
Sill
Sill
Dike
Batholith
Xenoliths
Extrusive (Volcanic) Igneous Rocks
Intrusive (Plutonic) Igneous Rocks

Domed shaped landform

Vertical landform

Magma inside

Phacolith

Horizontal Landform

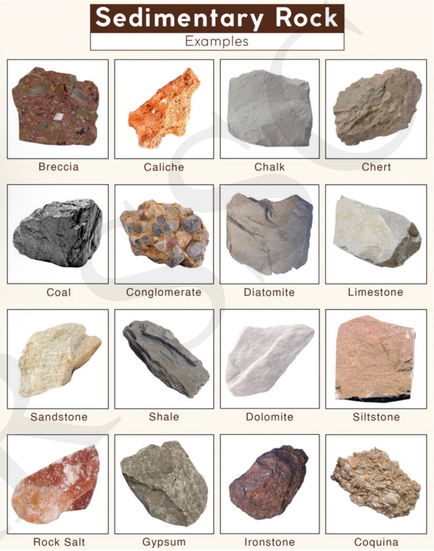
- Granite: Continental crust
- Basalt: Oceanic crust

Sedimentary Rock: Sediments are broken, transported, and deposited

- They exists in layers/strata
- In sedimentary compaction takes place – Lithifaction
- Fossils are found in it

Types:

1. Formed mechanically, eg: Sandstone, limestone and shale
2. Formed organically, eg: chalk, limestone, coal
3. Formed chemically, eg: Limestone, halite


Sedimentary Rock
Examples
Breccia
Caliche
Chalk
Chert
Coal
Conglomerate
Diatomite
Limestone
Sandstone
Shale
Dolomite
Siltstone
Rock Salt
Gypsum
Ironstone
Coquina

Metamorphic Rock: These rocks are formed by recrystallisation and reorganisation of materials within the original rocks

Igneous + Sedimentray → Metamorphic

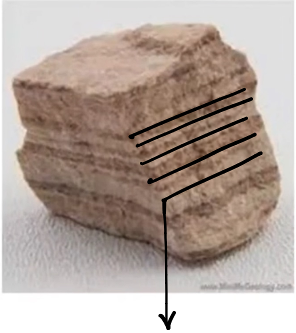
↓

Pressure
Volume
Temperature

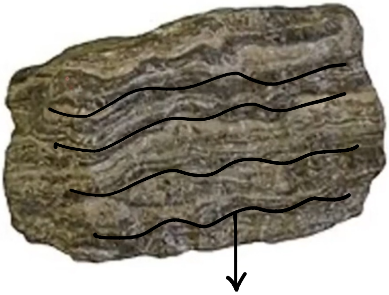
} change in forms → Metamorphosis

Types:

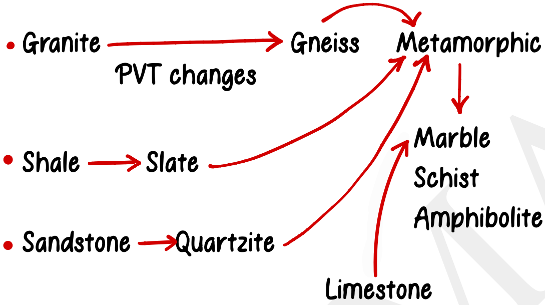
1. **Thermal Metamorphism**: metamorphic rocks formed due to a sudden temperature change
2. **Dynamic Metamorphism**: metamorphic rocks formed without any chemical change



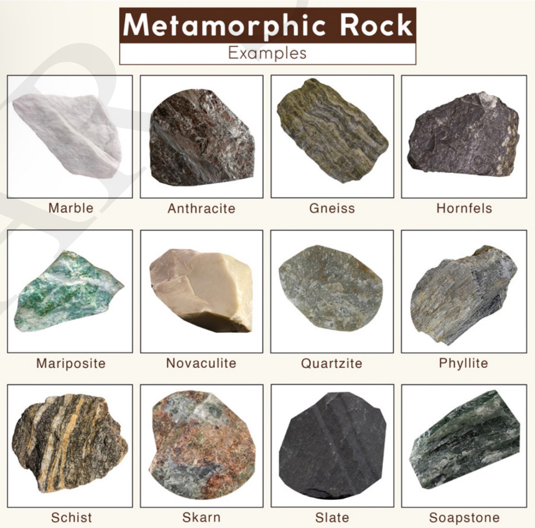
Alternate dark and light bands called **banding**



Lines formed called **Lineation**

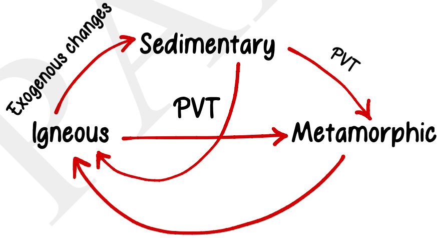


Granite
PVT changes
Gneiss
Metamorphic
Shale
Slate
Sandstone
Quartzite
Marble
Schist
Amphibolite
Limestone



Metamorphic Rock
Examples
Marble
Anthracite
Gneiss
Hornfels
Mariposite
Novaculite
Quartzite
Phyllite
Schist
Skarn
Slate
Soapstone

Rock Cycle



Exogenous changes
Sedimentary
PVT
PVT
Igneous
Metamorphic

Volcano

Types:

1. Cinder
2. Composite: most viscous lava
3. Shield: low viscosity lava
4. Caldera: most explosive lava, collapses on itself

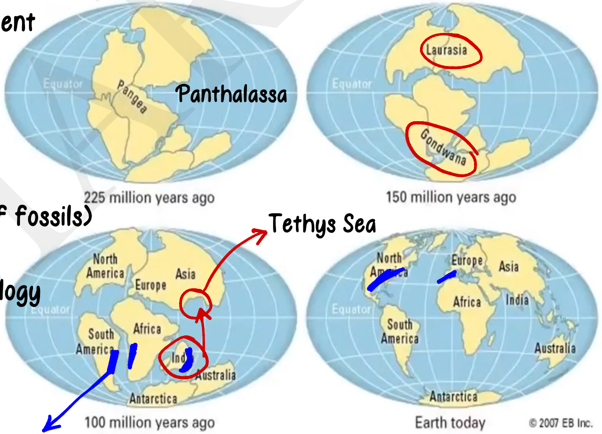
Continents and Oceans

- Alfred Wegener: Gave Continental Drift Theory, 1912

All of the modern-day continents had previously been clumped together in a supercontinent called Pangaea and the water body is called Panthalassa

→ **Evidences:**

- Jig Saw fit
- Fossils deposits: Palaeontology (study of fossils)
- Placer deposits



Equator
Pangaea
Panthalassa
Laurasia
Gondwana
North America
Europe
Asia
South America
Africa
India
Australia
Antarctica
Tethys Sea

225 million years ago

150 million years ago

100 million years ago

Earth today

© 2007 EB Inc.

Fossils deposits

Study of rock: Petrology

Types of rocks

Soft
eg: Talc

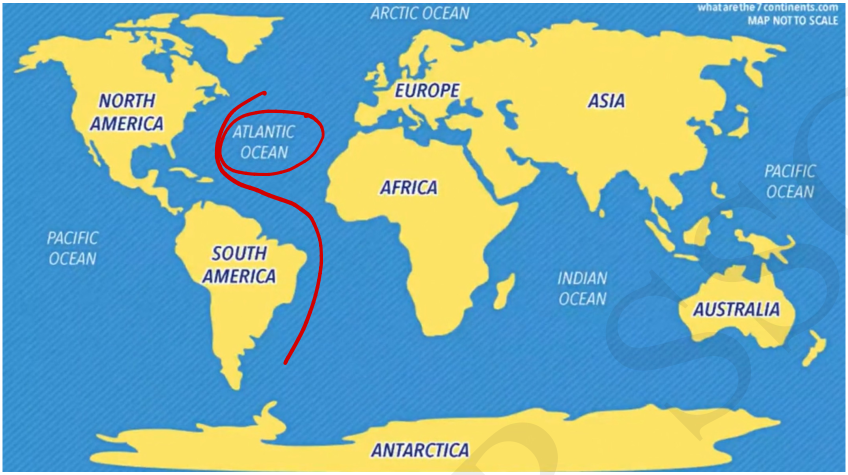
Hard
eg: Diamond

Convection cells
Due to
Residual heat
Radioactive decay

Two main sources of heat within the Earth

- Continental drift due to (as assumed by Alfred Wegener)
  1. Tidal force
  2. Polar fleeing force

But it occurs due to development of convection cells


ARCTIC OCEAN
whatarethe7continents.com
MAP NOT TO SCALE
NORTH AMERICA
ATLANTIC OCEAN
EUROPE
ASIA
AFRICA
PACIFIC OCEAN
SOUTH AMERICA
PACIFIC OCEAN
INDIAN OCEAN
AUSTRALIA
ANTARCTICA

- Decreasing order of Continents and Oceans

Area wise	Population basis
Asia	Asia
Africa	Africa
North America	Europe
South America	North America
Antarctica	South America
Europe	Australia
Australia	Antarctica

Mariana Trench deepest point: Challenger deep

deepest ocean

Oceans Order

P: Pacific Ocean

A: Atlantic Ocean (S-shape)

I: Indian Ocean

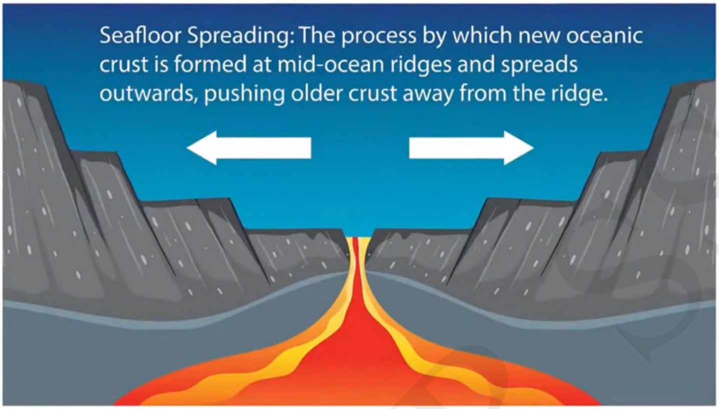
S: Southern (Atlantic)

A: Arctic

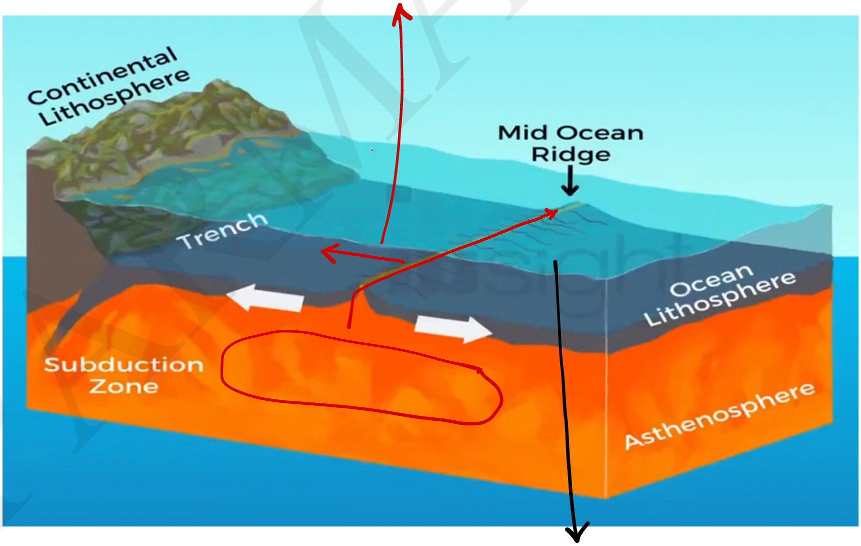
Busiest ocean

Sargasso Sea (brown algae Sargassum is seen here) - borderless sea

The Process of Seafloor Spreading

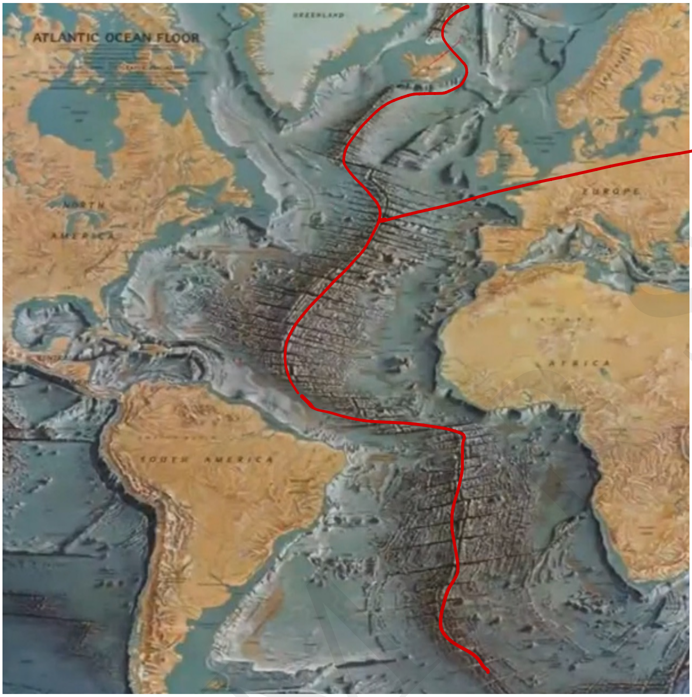

Seafloor Spreading: The process by which new oceanic crust is formed at mid-ocean ridges and spreads outwards, pushing older crust away from the ridge.

The age of oceanic rocks increases as you move away from the mid-ocean ridge


Continental Lithosphere
Mid Ocean Ridge
Trench
Ocean Lithosphere
Subduction Zone
Asthenosphere

Oceans has more relief features than continents (more diversity)

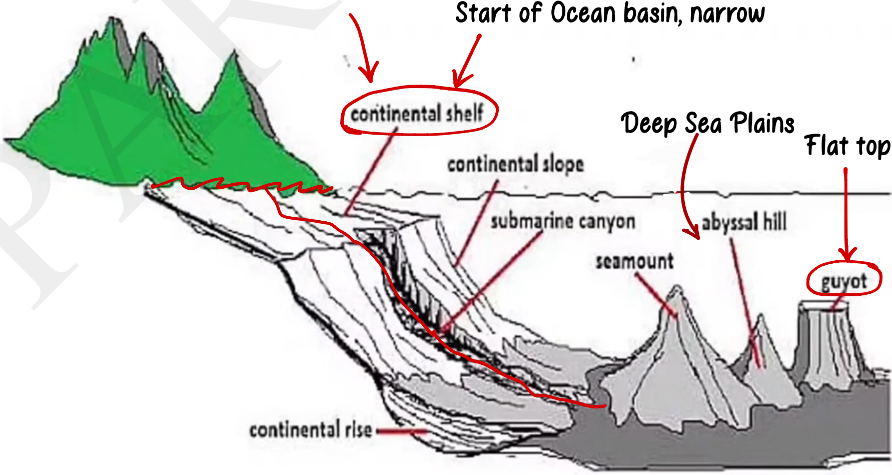
- Harry H. Hess gave seafloor spreading theory, 1962


ATLANTIC OCEAN FLOOR
GREENLAND
NORTH AMERICA
EUROPE
AFRICA
SOUTH AMERICA

created due to divergent plate boundary

Mid-Atlantic Ridge

Longest and largest landform on Earth

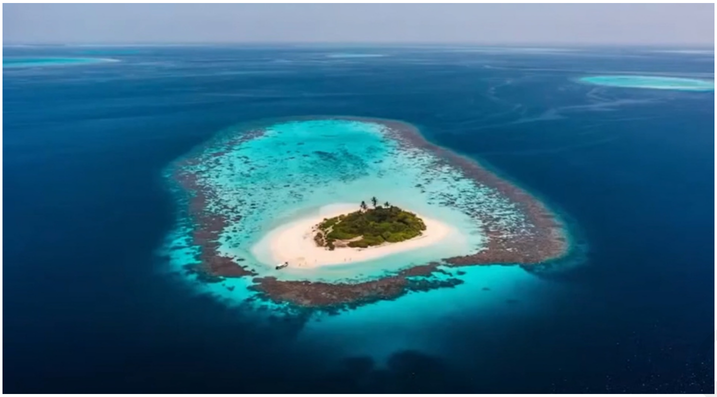

continental shelf
continental slope
submarine canyon
seamount
abyssal hill
guyot
continental rise

Petroleum extracted

Start of Ocean basin, narrow

Deep Sea Plains

Flat topped Sea Mount



- Minor relief feature: Atoll, sea mount, guyot

Corals: they are sea organisms, known as Rainforest of Sea

- Exists in symbiotic relationship with Zooxanthellae algae

↓ Makes food for corals

↑ Secretes $CaCO_3$ that provides protection to Zooxanthellae algae

- Corals exists in colony
- Favourable conditions:
  1. Saline water (cannot survive in fresh water)
  2. Sunlight
  3. Clear water
  4. Temperature: Moderate temperature 30-35°C
- Barrier Reef: Great Barrier Reef in Australia (largest)

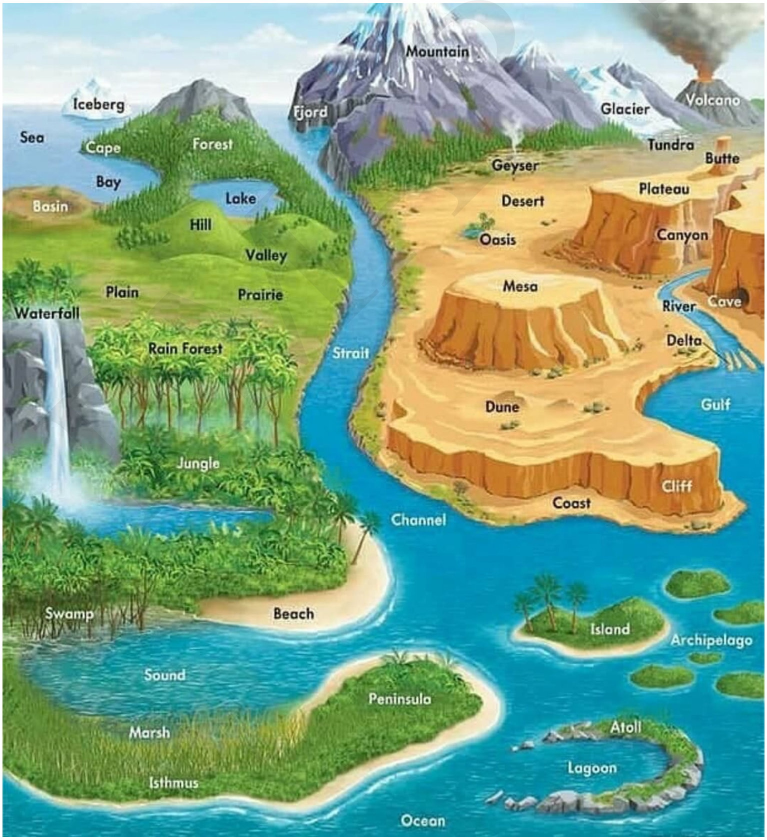
- Coral bleaching: when water is too warm, corals will expel the algae (Zooxanthellae) living in their tissues causing the corals to turn completely white

↓ due to climate change

→ Relief Feature of Oceans

- Major
  - Shelf → Slope → Rise → Abyssal plain
- Minor
  - Seamount
  - Guyot: flat-topped sea mount

GEOMORPHOLOGY
AND LANDFORMS


Mountain
Iceberg
Fjord
Glacier
Volcano
Sea
Cape
Forest
Tundra
Geyser
Butte
Bay
Lake
Desert
Plateau
Basin
Hill
Oasis
Canyon
Valley
Mesa
Plain
Prairie
River
Cave
Waterfall
Delta
Rain Forest
Strait
Dune
Gulf
Jungle
Cliff
Coast
Channel
Swamp
Beach
Island
Archipelago
Sound
Peninsula
Atoll
Marsh
Lagoon
Isthmus
Ocean

Geomorphology

- **Geomorphic process**: Changes in the configuration of Earth

Land build/elevate ↓ Endogenic forces

Erosion ↓ Exogenic forces

- **Example**:

Himalayas: continuously increasing → Endogenic > Exogenic
Aravalis: continuously decreasing → Exogenic > Endogenic

- **Endogenic forces**: the pressure within the earth, also known as internal forces

↓

Energy from:
Radioactive decay
Primordial heat

Changes categorised into:

1. **Diastrophism**: it is kind of process that move/elevate/build up the process of Earth

Endogenic Processes:

a. Orogenic: process through which mountains are built
b. Epeirogenic: other changes except mountain build up
c. Earthquake: shaking of Earth
d. Plate tectonics

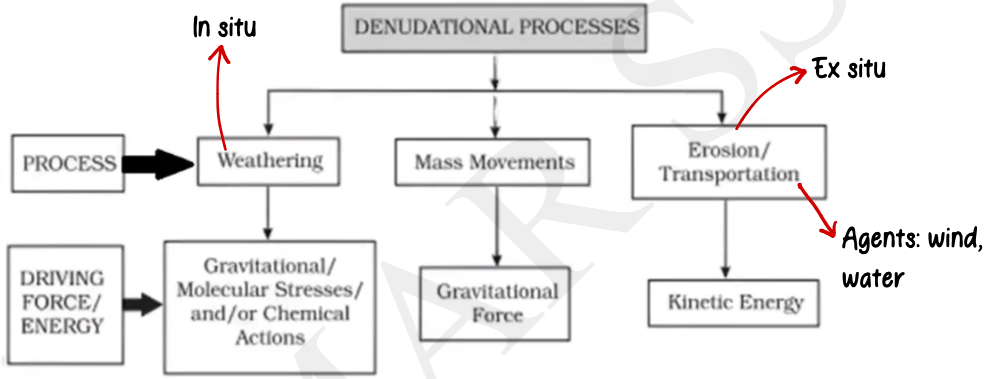
2. **Volcano**: openings/vents where lava or magma erupts

- **Exogenic Processes**: due to Exogenic forces, causes wearing and tearing

↓

- **Gradation**: wearing down of relief features of Earth

- Collectively Exogenic forces are called Denudation
- Exogenic Agents: running water, wind, waves, ground water
- Ultimately sources of energy for all exogenic forces: Sun


In situ
DENUDATIONAL PROCESSES
Ex situ
PROCESS
Weathering
Mass Movements
Erosion/ Transportation
Agents: wind, water
DRIVING FORCE/ ENERGY
Gravitational/ Molecular Stresses/ and/or Chemical Actions
Gravitational Force
Kinetic Energy

- Weathering: Action of elements of weather and climate over Earth Materials
  It is a in situ process
- Types of weathering:
  1. Chemical weathering: the erosion or disintegration of rocks, building materials, etc. caused by chemical reactions
  2. Physical/Mechanical weathering: disintegration without chemical change
  3. Biological weathering: caused by movement of plants and animals

- Effect of Weathering:
- Exfoliation: process when large, curved plates or slabs of rocks are stripped away from the outer surface of a rock mass

Mass Movement

- Fast
- Slow

weathering is not a pre-requisite for Mass Movement, it aids the Mass Movement

- Main force involved: Gravity

Types:

- Landslide
- Avalanche
- Earthquake
- Mud flow

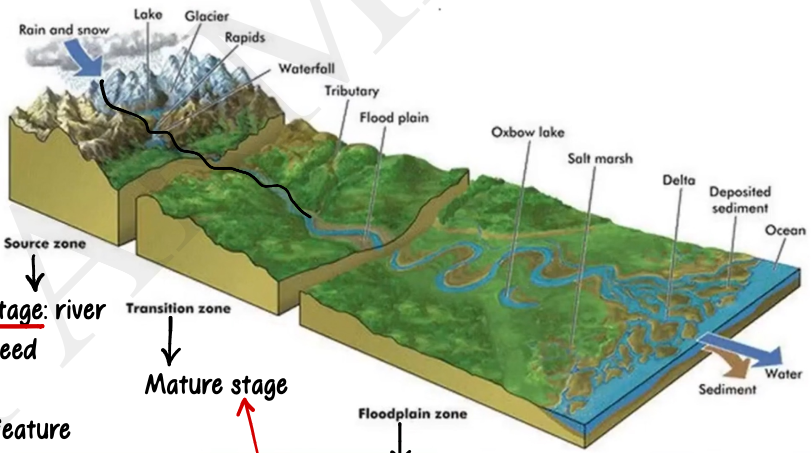
- Creep: slow downslope movement of particles
- Solifluction: slow progressive movement of mass down a slope

- Landforms

Types:

1. Erosional
2. Depositional

- Landforms Created by River


Rain and snow
Lake
Glacier
Rapids
Waterfall
Tributary
Flood plain
Oxbow lake
Salt marsh
Delta
Deposited sediment
Ocean
Water
Sediment
Source zone
Transition zone
Floodplain zone

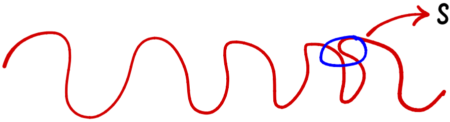
Youthful stage: river flows in speed → Erosional feature dominates

Mature stage

Old stage

Depositional feature dominates

- **Youth stage**: V-shaped valley, Gorges, Canyon, Waterfalls, Rapids, entrenched meander
- **Mature stage**: Meanders
- **Old**: ox-bow lake, delta, levees, flood plain

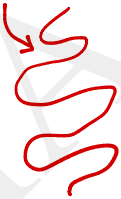


Separates and form ox bow lakes

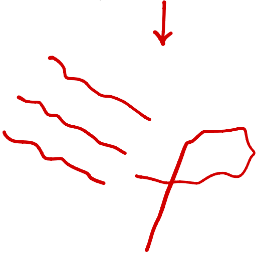
Erosional features:

- V-shaped valley, Gorges, Canyon, Waterfalls, Pothole, Plunge pools, River terraces

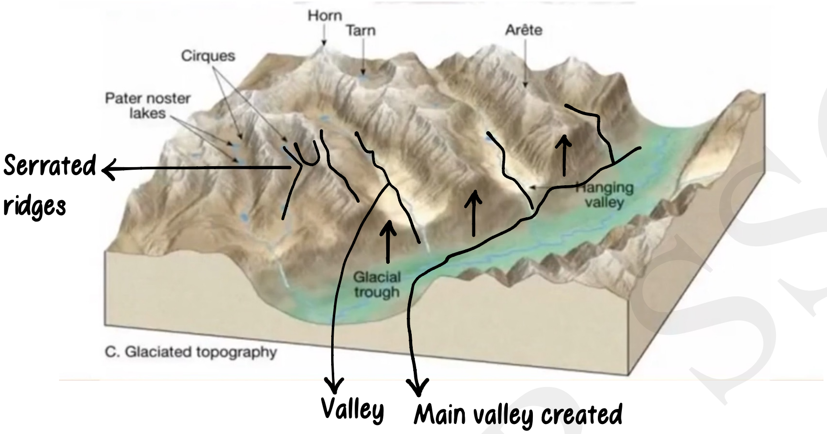
Incised Meanders: a meandering river valley that has cut down its bed into the bedrock because of uplift or lowered base level



- **Depositional features**: flood plains, Delta, ox bow lakes, meanders, Alluvial fans



Landforms Created by Glacier


Horn
Tarn
Arête
Cirques
Pater noster lakes
Serrated ridges
Hanging valley
Glacial trough
C. Glaciated topography
Valley
Main valley created

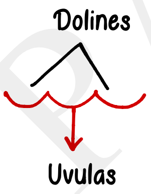
Erosional

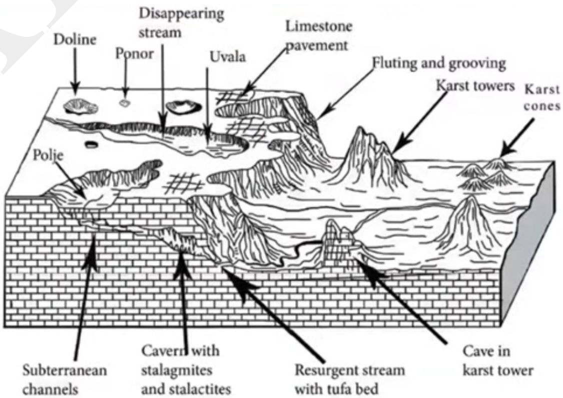
- Cirque: are created in heads of glacial valleys
- Ridges/Arête
- Horn
- Hanging Valley
- Glacial Valley

Depositional

- Moraine
- Eskers
- Drumlins
- Outwash plains

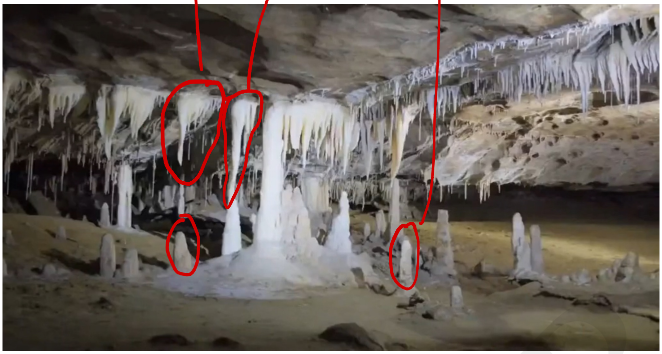
- Landforms Created by Groundwater: usually seen in places where rock is soft ↓ Dolomite/Limestone ↓ Chemical weathering


Dolines
Uvulas

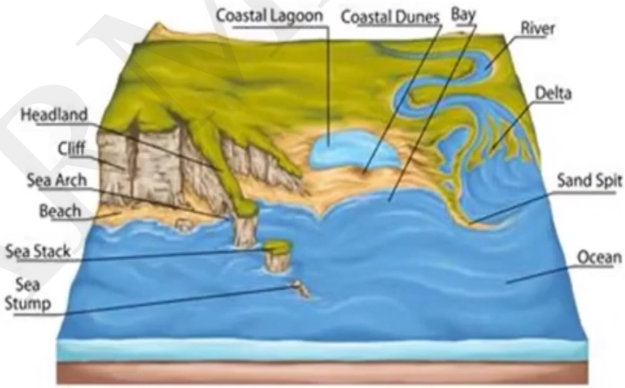

Disappearing stream
Doline
Ponor
Uvala
Limestone pavement
Fluting and grooving
Karst towers
Karst cones
Polje
Subterranean channels
Cavern with stalagmites and stalactites
Resurgent stream with tufa bed
Cave in karst tower

Karst Topography (in groundwater) ↓ Found in Karst region in Mediterranean Sea where rocks are made of Limestone and Dolomite → In India, mainly in South India

- **Erosional:** pools, sink holes, dolines, lapies, uvalas, limestones
- **Depositional:** Stalactite, Pillars, Stalagmite

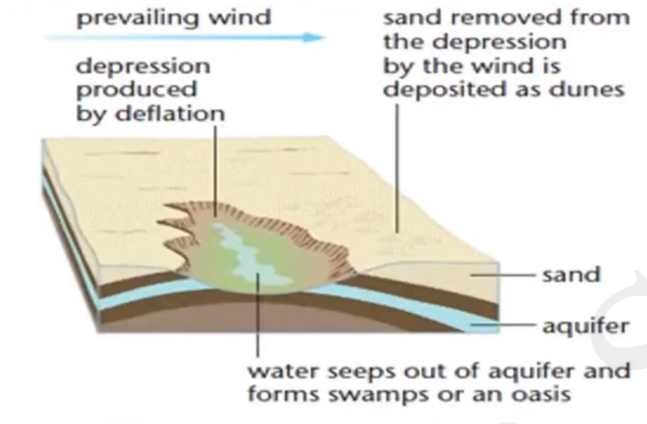


- **Landforms Created by Sea Waves**


Coastal Lagoon
Coastal Dunes
Bay
River
Delta
Headland
Cliff
Sea Arch
Beach
Sand Spit
Sea Stack
Ocean
Sea
Stump

- **Erosional:** cliff, caves, stack, arch
- **Depositional:** beaches, dunes, bars, barrier, spits

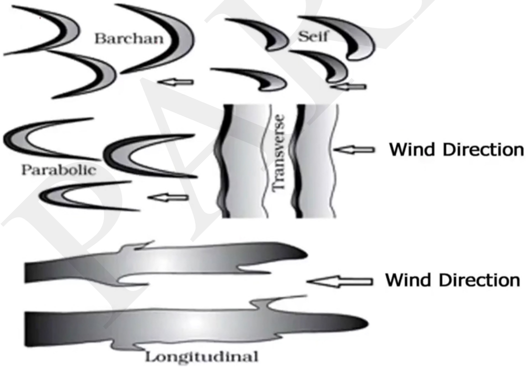
- Landforms Created by Wind


prevailing wind
depression produced by deflation
sand removed from the depression by the wind is deposited as dunes
sand
aquifer
water seeps out of aquifer and forms swamps or an oasis

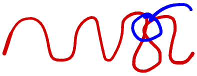
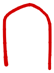
- Erosional: Pediplain, Playas, Mushroom rock, Pedestal rocks

- Depositional: Sand Dunes

Barchan Seif


Barchan
Seif
Parabolic
Transverse
Wind Direction
Wind Direction
Longitudinal

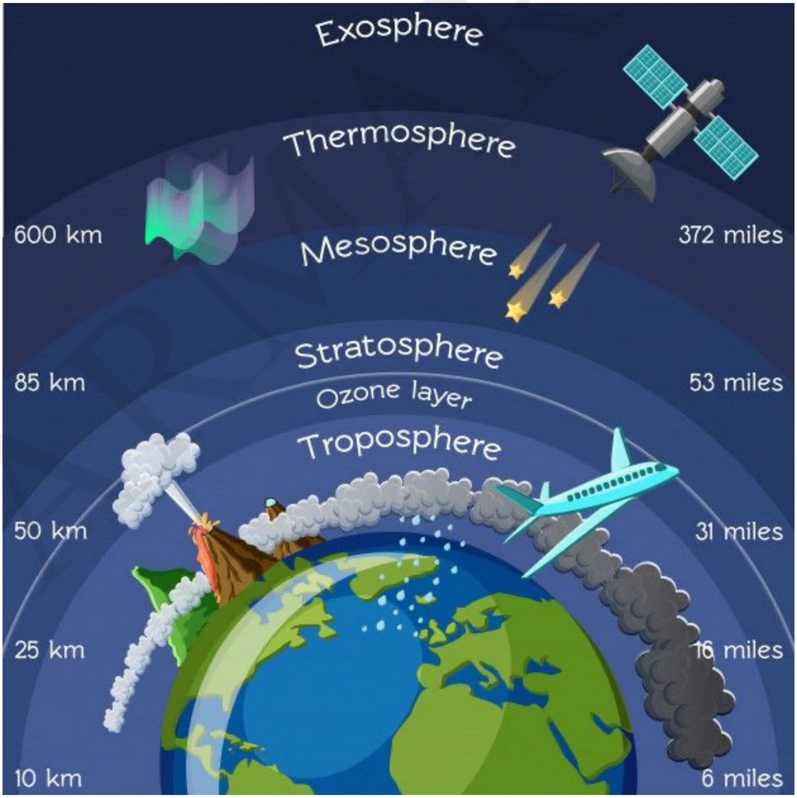
Mushroom Rock

1. Horn: Glacier
2. Lapie: sinkhole, pool, lapies, Dolines → Erosional landform by Groundwater
3. Ox-bow lakes:  River: old stage
4. Stack:  sea waves
5. Stalactite: groundwater

- Drumlins: glaciers
- Alluvial fan: river (youthful to mature stage)
- Barriers/Bar/Spit: sea waves
- Seif/Barchan : wind

- Only river that meanders in youthful stage: Jhelum

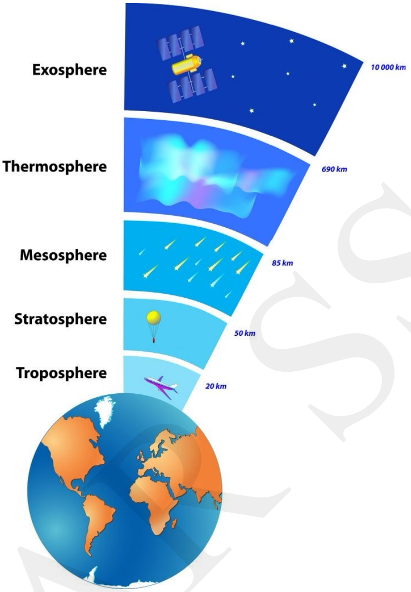
ATMOSPHERE AND WATER IN THE ATMOSPHERE


Exosphere
Thermosphere
600 km
372 miles
Mesosphere
Stratosphere
85 km
53 miles
Ozone layer
Troposphere
50 km
31 miles
25 km
16 miles
10 km
6 miles

- Our atmosphere divided into certain layers

TRICK to remember layers

- Thank you: Troposphere
- So: Stratosphere
- Much: Mesosphere
- The: Thermosphere
- Ex: Exosphere


Exosphere
10 000 km
Thermosphere
690 km
Mesosphere
85 km
Stratosphere
50 km
Troposphere
20 km

- Our atmosphere is a mixer of gases that surrounds Earth. It is kept in place by the pull of Earth's gravity

Evolution of Atmosphere

Stages:

1. Loss of primordial atmosphere- early atmosphere had more amount of H_2, He and due to excessive solar flares it vanished
2. Hot interior of Earth through volcanism
3. Modification by the living world (plants)

Troposphere

- Weather phenomenon
- Lowest layer of the atmosphere
- Height is variable:

Poles: 8 km
Equator: 18 km
Average: 13 km

Tropopause: a line that separates Troposphere from Stratosphere

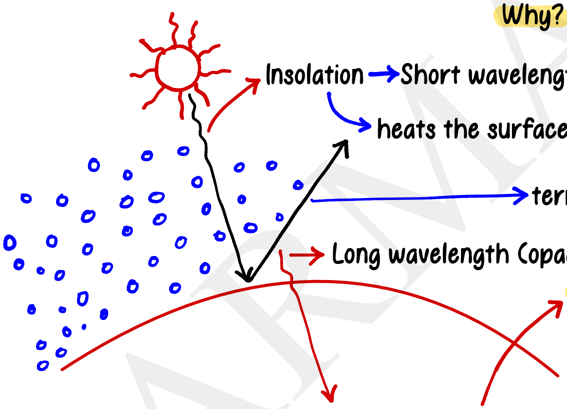
Composition of gases:

- N_2: 78%
- O_2: 21%
- Ar: 0.9% (second most abundant inert gas)
- CO_2: 0.036%
- He

Troposphere generally decreases with altitude

this is called Lapse Rate
165 m 1°C
1 km 6.5°C

Why?



Insolation → Short wavelength (transparent)

heats the surface of Earth

terrestrial radiation → Heats the atmosphere

Long wavelength (opaque)

Greenhouse effect

Green House Gases:

- Water vapour
- CO_2
- CH_4
- SO_2
- O_3 → Ozone

- NO_2 is not greenhouse gas

- Tropospheric Ozone is bad for our environment

Atmosphere heats up due to:

1. **Conduction**: layer that's near to Earth will heat through conduction (also vertical)
2. **Convection**: Vertically transfer of heat after conduction
3. **Advection**: Horizontal transfer of heat eg: loo is a result of advection

- Insolation

- Aphelion: the point when Earth is very far away from Sun (4th July)- Insolation less
- Perihelion: when Earth is closest to the Sun (3rd Jan)

  → Insolation is more

- Equator: Insolation is less here, due to presence of clouds
- Tropics: Insolation is high here as no good amount of clouds

  ↓ max. at desert

Factors affecting Insolation:

1. Transparency of atmosphere
2. Length of the day
3. Tilt of the Earth
4. Rotation

- **Heat Budget**: When Earth's surface maintains its normal temperature, neither cools nor heat up

- *** Albedo**: percentage of light reflected by an object
  - ↓ Highest albedo: Ice caps/glaciers

- **Temperature inversion**: a layer in the atmosphere in which air temperature increases with height
- **Conditions favourable**:
  1. Long winter night
  2. Still air
  3. Clear cloudless sky

Stratosphere

- Ozone layer is seen here: protects from harmful UV rays → reaction is highly exothermic
- Ozone layer seen b/w 30-35 km
- Temperature increases with altitude/moving upwards
- Jet planes fly in this layer

- Ozone day: 16th Sept → 16 Sept 1987
  - ↓ Montreal, Canada → Montreal Protocol
    - ↓ Kigali Amendment made to phase out HFCs
    - ↓ Phase out CFCs (makes ozone layer thin) → Ozone hole
      - ↓ Ozone layer thickness measured by: Dobson unit

- **Stratopause**: divides stratosphere and mesosphere

Mesosphere

- Coldest layer atmosphere
- Meteorites end here
- Temperature decrease with altitude

Thermosphere

- Hottest layer
- Temperature increases with altitude
- Ions are seen here hence known as Ionosphere layer ↓ Reflects radiowaves

- Karman line: boundary b/w the Earth's atmosphere and Exosphere
  ↓ 100 km

- Isotherm: lines connecting the points having same temperature

Water in the Atmosphere

97.2% → Saline water

2.8% → Fresh water ↓

- Ice caps/glaciers → 2% → All out of 2.8%
- Ground water → 0.68%
- Lakes → 0.4%
- Atmosphere
- Rivers

order of freshwater

As a whole (Freshwater)

- Ice caps/glaciers: 68.7%
- Groundwater: 30.1%

Water Cycle

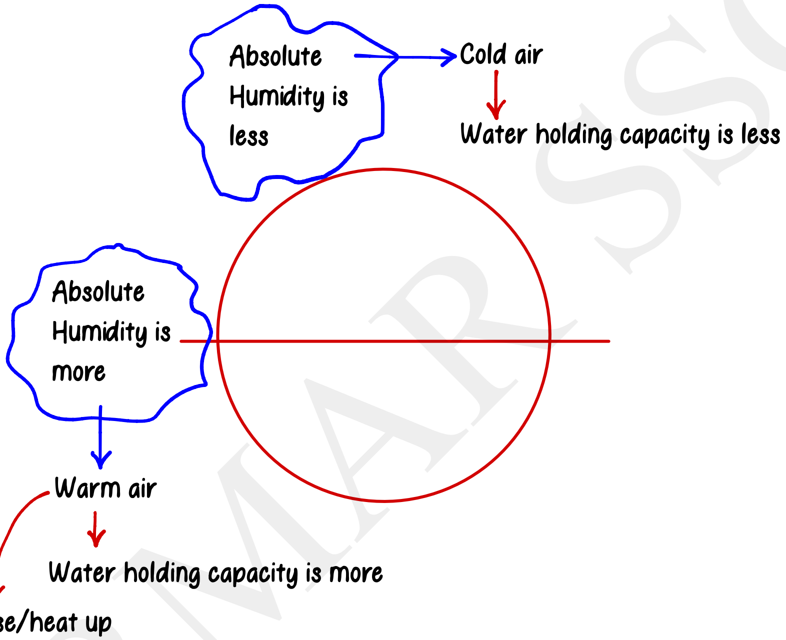
Processes:

- Evaporation: water (liquid) → water vapour (gas)
- Condensation: water vapour → water
- Precipitation: rain, snow, hail → any kind of weather condition where something falling from sky

- Humidity: water vapour present in atmosphere

- Types:

1. **Absolute Humidity**: actual amount of water vapour present in atmosphere
2. **Relative Humidity**: % of moisture present in atmosphere compared to its full capacity


Absolute Humidity is less
Cold air
Water holding capacity is less
Absolute Humidity is more
Warm air
Water holding capacity is more
Rise/heat up

- Dew Point: temperature at which saturation occurs

- Condensation

Different forms:

- Dew: moisture that forms as a result of condensation
- Fog (कोहरा)
- Mist (कुहासा)

Fog, Mist: no solid surface needed, water vapour condenses around hygroscopic particles

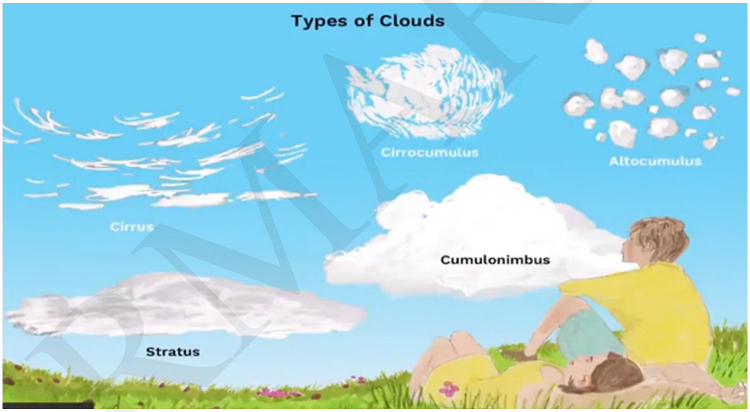
- in winter air cools down due to which dew point reduces: water vapour → water

- Frost: deposition of white crystals
- Clouds

- **Fog**: Big particles
- **Mist**: Small particles

Different Types of Clouds

- Low level clouds
  - Nimbus
    - rain bearing
    - black/dark grey coloured
    - opaque to sunlight
  - Stratus → layered clouds
- High level clouds
  - Cumulus
    - Flat base, Wool shaped
    - does not rain
    - cotton wool
    - flat base
    - 4000-7000 m
  - Cirrus
    - High altitude
    - Feathery appearance
    - does not cause rain

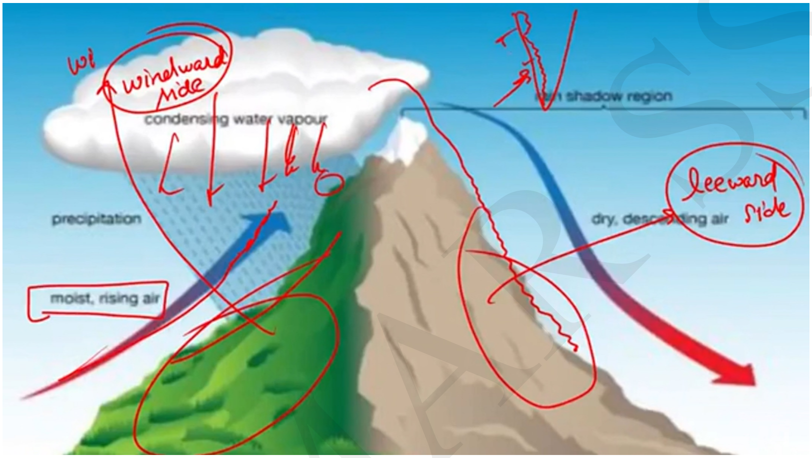

Types of Clouds
Cirrocumulus
Altocumulus
Cirrus
Cumulonimbus
Stratus

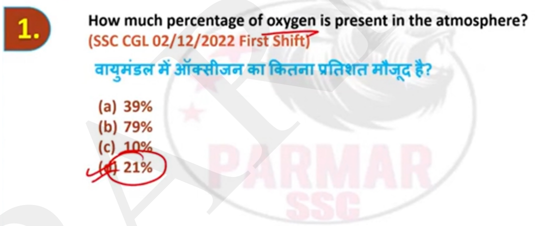
Types of Rainfall

- Rainfall is a precipitation
  - Hail
    - Size: big
  - Sleet
    - Frozen and refrozen drops
    - Size: small

3 types of rainfall:

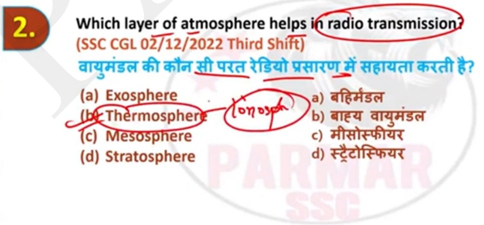
1. **Convectional:** occurs when surface of the Earth is heated up by the Sun
2. **Orographic:** rainfall caused due to mountain
3. **Cyclonic:** due to cyclone


wi
windward side
condensing water vapour
rain shadow region
precipitation
moist, rising air
leeward side
dry, descending air



1. How much percentage of oxygen is present in the atmosphere?
(SSC CGL 02/12/2022 First Shift)
वायुमंडल में ऑक्सीजन का कितना प्रतिशत मौजूद है?

(a) 39%
(b) 79%
(c) 10%
[✓ (d) 21%]



2. Which layer of atmosphere helps in radio transmission?
(SSC CGL 02/12/2022 Third Shift)
वायुमंडल की कौन सी परत रेडियो प्रसारण में सहायता करती है?

(a) Exosphere
[✓ (b) Thermosphere] Ionosph
(c) Mesosphere
(d) Stratosphere

a) बहिर्मंडल
b) बाह्य वायुमंडल
c) मीसोस्फीयर
d) स्ट्रैटोस्फियर

upper troposphere

3. At what height do the Jet Streams blow in India during winter months? (SSC CPO 11/11/2022 Forth Shift)

18km

सर्दियों के महीनों के दौरान भारत में जेट स्ट्रीम कितनी ऊँचाई पर बहती हैं?

(a) 9-15km
(b) 9-17km
(c) 9-16km
[✓ (d) 9-13km]

4. Which of the following gases shields the surface of earth from ultraviolet (UV) radiation from the sun?
(SSC MTS 14/07/2022 Morning Shift)

निम्नलिखित में से कौन सी गैस पृथ्वी की सतह को सूर्य से पराबैंगनी (यूवी) विकिरण से बचाती है?

a) Carbon monoxide
[✓ b) Ozone]
c) Oxygen
d) Carbon Dioxide

a) कार्बन मोनोआक्साइड
b) ओजोन
c) ऑक्सीजन
d) कार्बन डाईऑक्साइड

5. Which two gases are having the highest percentage of the earth’s atmosphere?. (SSC CHSL 06/06/2022 Afternoon)

पृथ्वी के वायुमंडल में सर्वाधिक प्रतिशतता किन दो गैसों की है?

(a) Nitrogen and hydrogen
[✓ (b) Nitrogen and Oxygen]
(c) Oxygen and Carbon Monoxide → Poisonous gas
(d) Carbon dioxide and nitrogen

a) नाइट्रोजन और हाइड्रोजन
b) नाइट्रोजन और ऑक्सीजन
c) ऑक्सीजन और कार्बन मोनोऑक्साइड
d) कार्बन डाइऑक्साइड और नाइट्रोजन

6. The ____ lies above the mesosphere and is a region in which temperature increases with height .
(SSC CGL 20/04/2022 Afternoon)

____मध्यमंडल के ऊपर स्थित है और यह एक ऐसा क्षेत्र है जिसमें ऊंचाई के साथ तापमान बढ़ता है।

(a) Stratosphere
(b) Exosphere
[✓ (c) Thermosphere]
(d) Troposphere

a) स्ट्रैटोस्फियर
b) बहिर्मंडल
c) बाहय वायुमंडल
d) क्षोभ मंडल

7. What is the approximate percentage contribution of argon in Earth’s atmosphere? (SSC MTS 14/10/2021 Morning Shift)

पृथ्वी के वायुमंडल में आर्गन का लगभग प्रतिशत योगदान कितना है?

[✓ (a) 1%]
(b) 2%
(c) 3%
(d) 4%

8. Which layer of atmosphere can experience the burning up of meteorites? (SSC MTS 27/10/2021 Evening)

वायुमंडल की कौन सी परत उल्कापिंडों के जलने का अनुभव कर सकती है?

[✓ (a) Mesosphere]
(b) Exosphere
(c) Thermosphere
(d) stratosphere

a) मीसोस्फीयर
b) बहिर्मंडल
c) बाह्य वायुमंडल
d) समताप मंडल

9. Which of the following is NOT a greenhouse gas?.
(SSC CGL 17/08/2021 Morning)

निम्नलिखित में से कौन सी ग्रीनहाउस गैस नहीं है?

[✓ (a) Helium]
(b) Water vapour
(c) Surface-level ozone
(d) Nitrous oxide

a) हीलियम
b) जल वाष्प
c) सतह-स्तर-ओजोन
d) नाइट्रस ऑक्साइड

10. ____ is a naturally occurring phenomenon that is responsible for the heating of the Earth's surface and atmosphere.
(SSC CPO 25/11/2020 Evening)

____ एक प्राकृतिक रूप से घटित होने वाली घटना है जो पृथ्वी की सतह और वायुमंडल के गर्म होने के लिए जिम्मेदार है

(a) Radiation
(b) Global warming
[✓ (c) Green house effect]
(d) Global heating

a) विकिरण
b) ग्लोबल वार्मिंग
c) ग्रीनहाउस प्रभाव
d) वैश्विक तापन

11. The ________ layer is the upper limit of our atmosphere. It extends from the top of the atmosphere up to 10,000km (6200miles).
(SSC CHSL 14/10/2020 Morning)

________ परत हमारे वायुमंडल की ऊपरी सीमा है। यह वायुमंडल के शीर्ष से 10,000 किमी (6200 मील) तक फैला हुआ है।

(a) Ionosphere
[✓ (b) Exosphere]
(c) Troposphere
(d) Mesosphere

a) योण क्षेत्र
b) बहिर्मंडल
c) क्षोभ मंडल
d) मीसोस्फीयर

12. Which is the second most abundant gas in Earth's atmosphere?
(SSC CHSL 16/10/2020 Morning Shift)

पृथ्वी के वायुमंडल में दूसरी सबसे प्रचुर गैस कौन सी है?

[✓ (a) Oxygen]
(b) Nitrogen
(c) Hydrogen
(d) Carbon monoxide

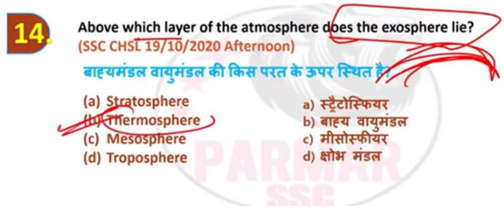
a) ऑक्सीजन
b) नाइट्रोजन
c) हाइड्रोजन
d) कार्बन मोनोआक्साइड

13. Which environmental phenomenon has been linked to synthetic chemicals like chlorofluorocarbons (CFC's)?
(SSC CHSL 19/10/2020 Afternoon)

क्लोरोफ्लोरोकार्बन (सीएफसी) जैसे सिंथेटिक रसायनों से कौन सी पर्यावरणीय घटना जुड़ी हुई है?

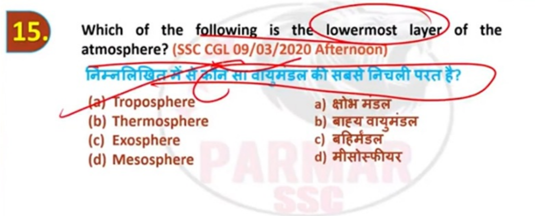
(a) Electromagnetic interference
(b) Tidal Flow
[✓ (c) Ozone depletion]
(d) Wave propagation

a) विद्युतचुंबकीय व्यवधान
b) ज्वारीय प्रवाह
c) ओज़ोन रिक्तीकरण
d) लहर प्रसार


14. Above which layer of the atmosphere does the exosphere lie? (SSC CHSL 19/10/2020 Afternoon)

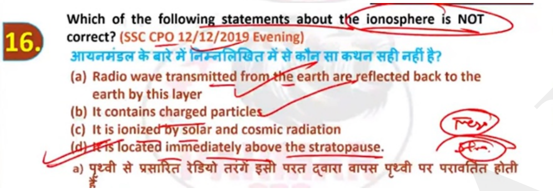
बाह्यमंडल वायुमंडल की किस परत के ऊपर स्थित है?

(a) Stratosphere	a) स्ट्रैटोस्फियर
(b) Thermosphere	b) बाह्य वायुमंडल
(c) Mesosphere	c) मीसोस्फीयर
(d) Troposphere	d) क्षोभ मंडल


15. Which of the following is the lowermost layer of the atmosphere? (SSC CGL 09/03/2020 Afternoon)

निम्नलिखित में से कौन सा वायुमंडल की सबसे निचली परत है?

(a) Troposphere	a) क्षोभ मंडल
(b) Thermosphere	b) बाह्य वायुमंडल
(c) Exosphere	c) बहिर्मंडल
(d) Mesosphere	d) मीसोस्फीयर


16. Which of the following statements about the ionosphere is NOT correct? (SSC CPO 12/12/2019 Evening)

आयनमंडल के बारे में निम्नलिखित में से कौन सा कथन सही नहीं है?

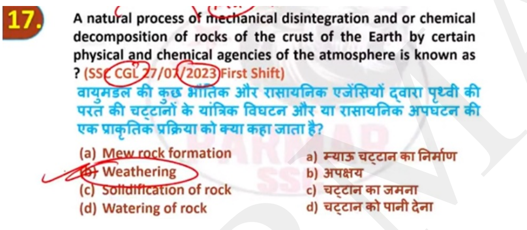
(a) Radio wave transmitted from the earth are reflected back to the earth by this layer

(b) It contains charged particles

(c) It is ionized by solar and cosmic radiation

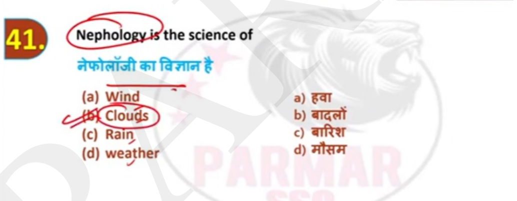
(d) It is located immediately above the stratopause.

a) पृथ्वी से प्रसारित रेडियो तरंगें इसी परत द्वारा वापस पृथ्वी पर परावर्तित होती हैं


17. A natural process of mechanical disintegration and or chemical decomposition of rocks of the crust of the Earth by certain physical and chemical agencies of the atmosphere is known as ? (SSC CGL 27/07/2023 First Shift)

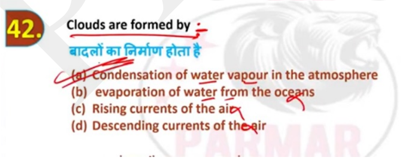
वायुमंडल की कुछ भौतिक और रासायनिक एजेंसियों द्वारा पृथ्वी की परत की चट्टानों के यांत्रिक विघटन और या रासायनिक अपघटन की एक प्राकृतिक प्रक्रिया को क्या कहा जाता है?

(a) Mew rock formation	a) म्याऊ चट्टान का निर्माण
(b) Weathering	b) अपक्षय
(c) Solidification of rock	c) चट्टान का जमना
(d) Watering of rock	d) चट्टान को पानी देना


41. Nephology is the science of

नेफोलॉजी का विज्ञान है

(a) Wind	a) हवा
(b) Clouds	b) बादलों
(c) Rain	c) बारिश
(d) weather	d) मौसम


42. Clouds are formed by

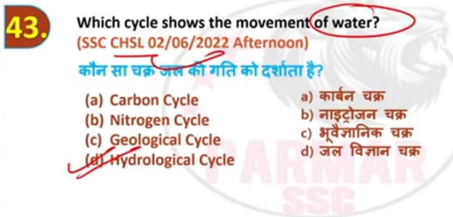
बादलों का निर्माण होता है

(a) Condensation of water vapour in the atmosphere

(b) evaporation of water from the oceans

(c) Rising currents of the air

(d) Descending currents of the air

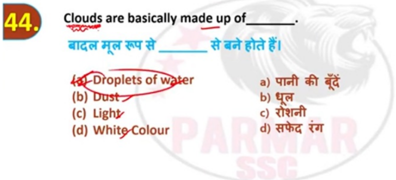


43. Which cycle shows the movement of water?

(SSC CHSL 02/06/2022 Afternoon)

कौन सा चक्र जल की गति को दर्शाता है?

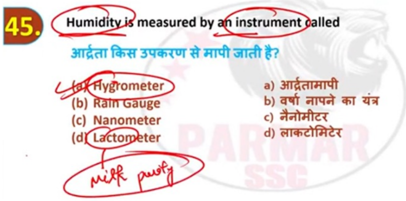
- (a) Carbon Cycle — a) कार्बन चक्र
- (b) Nitrogen Cycle — b) नाइट्रोजन चक्र
- (c) Geological Cycle — c) भूवैज्ञानिक चक्र
- [✓ (d) Hydrological Cycle] — d) जल विज्ञान चक्र



44. Clouds are basically made up of_______.

बादल मूल रूप से _______ से बने होते हैं।

- [✓ (a) Droplets of water] — a) पानी की बूँदें
- (b) Dust — b) धूल
- (c) Light — c) रोशनी
- (d) White Colour — d) सफेद रंग

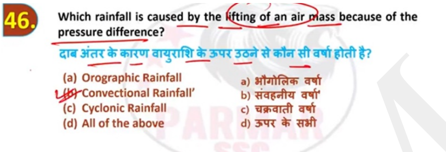


45. Humidity is measured by an instrument called

आर्द्रता किस उपकरण से मापी जाती है?

- [✓ (a) Hygrometer] — a) आर्द्रतामापी
- (b) Rain Gauge — b) वर्षा नापने का यंत्र
- (c) Nanometer — c) नैनोमीटर
- (d) Lactometer — d) लाकटोमिटेर

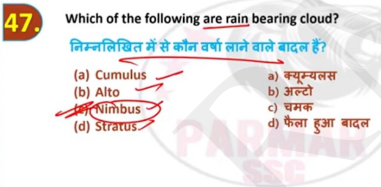
milk purity



46. Which rainfall is caused by the lifting of an air mass because of the pressure difference?

दाब अंतर के कारण वायुराशि के ऊपर उठने से कौन सी वर्षा होती है?

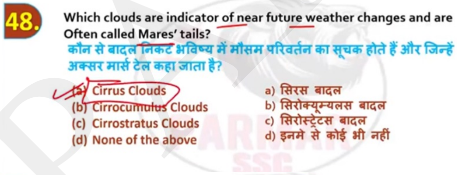
- (a) Orographic Rainfall — a) भौगोलिक वर्षा
- [✓ (b) Convectional Rainfall'] — b) संवहनीय वर्षा'
- (c) Cyclonic Rainfall — c) चक्रवाती वर्षा
- (d) All of the above — d) ऊपर के सभी



47. Which of the following are rain bearing cloud?

निम्नलिखित में से कौन वर्षा लाने वाले बादल हैं?

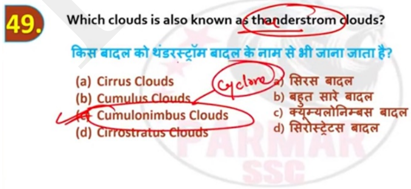
- (a) Cumulus — a) क्यूम्यलस
- (b) Alto — b) अल्टो
- [✓ (c) Nimbus] — c) चमक
- (d) Stratus — d) फैला हुआ बादल



48. Which clouds are indicator of near future weather changes and are Often called Mares' tails?

कौन से बादल निकट भविष्य में मौसम परिवर्तन का सूचक होते हैं और जिन्हें अक्सर मार्स टेल कहा जाता है?

- [✓ (a) Cirrus Clouds] — a) सिरस बादल
- (b) Cirrocumulus Clouds — b) सिरोक्यूम्यलस बादल
- (c) Cirrostratus Clouds — c) सिरोस्ट्रेटस बादल
- (d) None of the above — d) इनमे से कोई भी नहीं

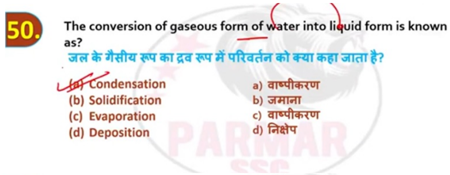


49. Which clouds is also known as thanderstrom clouds?

किस बादल को थंडरस्ट्रॉम बादल के नाम से भी जाना जाता है?

- (a) Cirrus Clouds — a) सिरस बादल
- (b) Cumulus Clouds — b) बहुत सारे बादल
- [✓ (c) Cumulonimbus Clouds] — c) क्यूम्यलोनिम्बस बादल
- (d) Cirrostratus Clouds — d) सिरोस्ट्रेटस बादल

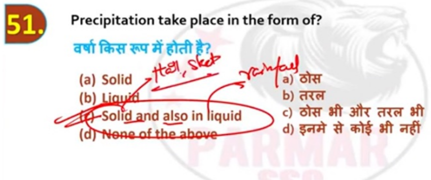
Cyclone



50. The conversion of gaseous form of water into liquid form is known as?

जल के गैसीय रूप का द्रव रूप में परिवर्तन को क्या कहा जाता है?

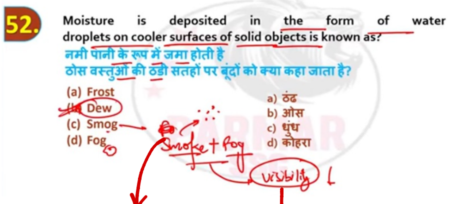
- [✓ (a) Condensation] — a) वाष्पीकरण
- (b) Solidification — b) जमाना
- (c) Evaporation — c) वाष्पीकरण
- (d) Deposition — d) निक्षेप



51. Precipitation take place in the form of?

वर्षा किस रूप में होती है?

- (a) Solid — a) ठोस
- (b) Liquid — b) तरल
- [✓ (c) Solid and also in liquid] — c) ठोस भी और तरल भी
- (d) ~~None of the above~~ — d) इनमे से कोई भी नहीं



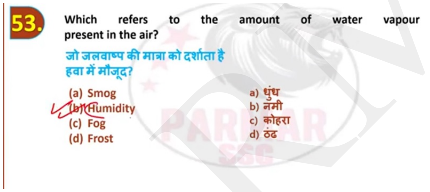
52. Moisture is deposited in the form of water droplets on cooler surfaces of solid objects is known as?

नमी पानी के रूप में जमा होती है
ठोस वस्तुओं की ठंडी सतहों पर बूंदों को क्या कहा जाता है?

- (a) Frost — a) ठंढ
- [✓ (b) Dew] — b) ओस
- (c) Smog — c) धुंध
- (d) Fog — d) कोहरा

Hygroscopic particle released from vehicles as pollution particles

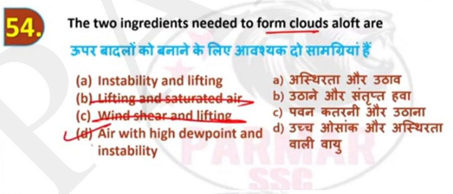
Visibility is low



53. Which refers to the amount of water vapour present in the air?

जो जलवाष्प की मात्रा को दर्शाता है हवा में मौजूद?

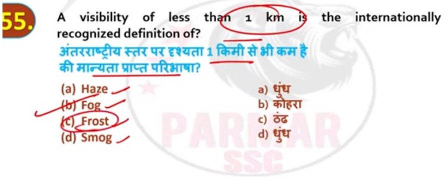
- (a) Smog — a) धुंध
- [✓ (b) Humidity] — b) नमी
- (c) Fog — c) कोहरा
- (d) Frost — d) ठंढ



54. The two ingredients needed to form clouds aloft are

ऊपर बादलों को बनाने के लिए आवश्यक दो सामग्रियां हैं

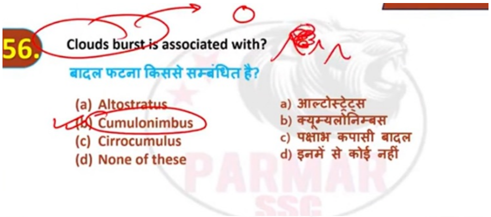
- (a) Instability and lifting — a) अस्थिरता और उठाव
- (b) ~~Lifting and saturated air~~ — b) उठाने और संतृप्त हवा
- (c) ~~Wind shear and lifting~~ — c) पवन कतरनी और उठाना
- [✓ (d) Air with high dewpoint and instability] — d) उच्च ओसांक और अस्थिरता वाली वायु



55. A visibility of less than 1 km is the internationally recognized definition of?

अंतरराष्ट्रीय स्तर पर दृश्यता 1 किमी से भी कम है की मान्यता प्राप्त परिभाषा?

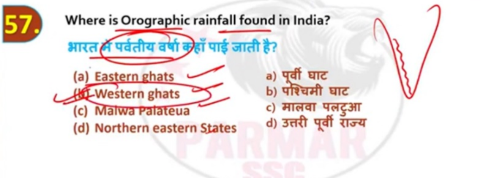
- (a) Haze — a) धुंध
- [✓ (b) Fog] — b) कोहरा
- (c) Frost — c) ठंढ
- (d) Smog — d) धुंध



56. Clouds burst is associated with?

बादल फटना किससे सम्बंधित है?

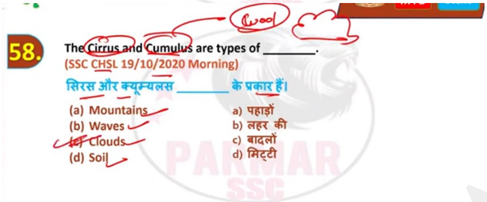
(a) Altostratus	a) आल्टोस्ट्रेट्स
[✓ (b) Cumulonimbus]	b) क्यूम्यलोनिम्बस
(c) Cirrocumulus	c) पक्षाभ कपासी बादल
(d) None of these	d) इनमें से कोई नहीं



57. Where is Orographic rainfall found in India?

भारत में पर्वतीय वर्षा कहाँ पाई जाती है?

(a) Eastern ghats	a) पूर्वी घाट
[✓ (b) Western ghats]	b) पश्चिमी घाट
(c) Malwa Palateua	c) मालवा पलटुआ
(d) Northern eastern States	d) उत्तरी पूर्वी राज्य

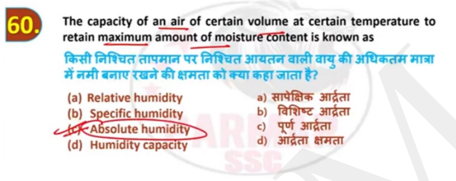


Cool

58. The Cirrus and Cumulus are types of ________.
(SSC CHSL 19/10/2020 Morning)

सिरस और क्यूम्यलस ________ के प्रकार हैं।

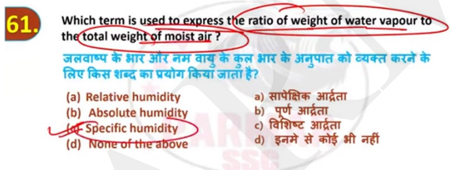
(a) Mountains	a) पहाड़ों
(b) Waves	b) लहर की
[✓ (c) Clouds]	c) बादलों
(d) Soil	d) मिट्टी



60. The capacity of an air of certain volume at certain temperature to retain maximum amount of moisture content is known as

किसी निश्चित तापमान पर निश्चित आयतन वाली वायु की अधिकतम मात्रा में नमी बनाए रखने की क्षमता को क्या कहा जाता है?

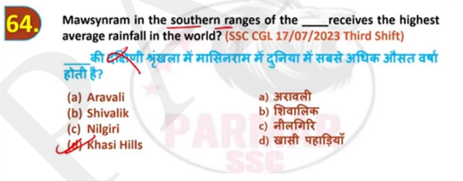
(a) Relative humidity	a) सापेक्षिक आर्द्रता
(b) Specific humidity	b) विशिष्ट आर्द्रता
[✓ (c) Absolute humidity]	c) पूर्ण आर्द्रता
(d) Humidity capacity	d) आर्द्रता क्षमता



61. Which term is used to express the ratio of weight of water vapour to the total weight of moist air ?

जलवाष्प के भार और नम वायु के कुल भार के अनुपात को व्यक्त करने के लिए किस शब्द का प्रयोग किया जाता है?

(a) Relative humidity	a) सापेक्षिक आर्द्रता
(b) Absolute humidity	b) पूर्ण आर्द्रता
[✓ (c) Specific humidity]	c) विशिष्ट आर्द्रता
(d) None of the above	d) इनमे से कोई भी नहीं

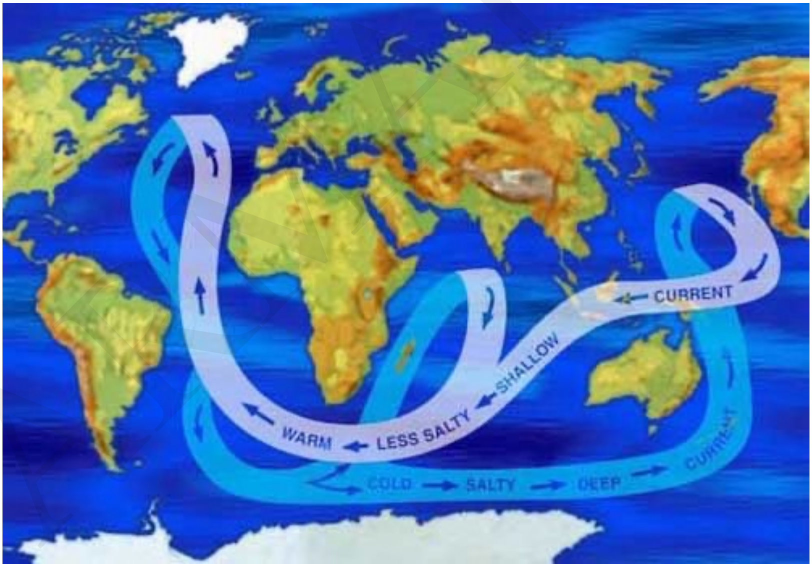


64. Mawsynram in the southern ranges of the ____receives the highest average rainfall in the world? (SSC CGL 17/07/2023 Third Shift)

____की दक्षिणी श्रृंखला में मासिनराम में दुनिया में सबसे अधिक औसत वर्षा होती है?

(a) Aravali	a) अरावली
(b) Shivalik	b) शिवालिक
(c) Nilgiri	c) नीलगिरि
[✓ (d) Khasi Hills]	d) खासी पहाड़ियाँ

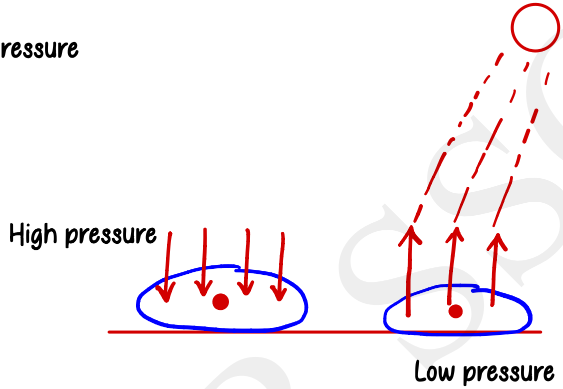
WINDS, CLIMATE, OCEAN CURRENTS

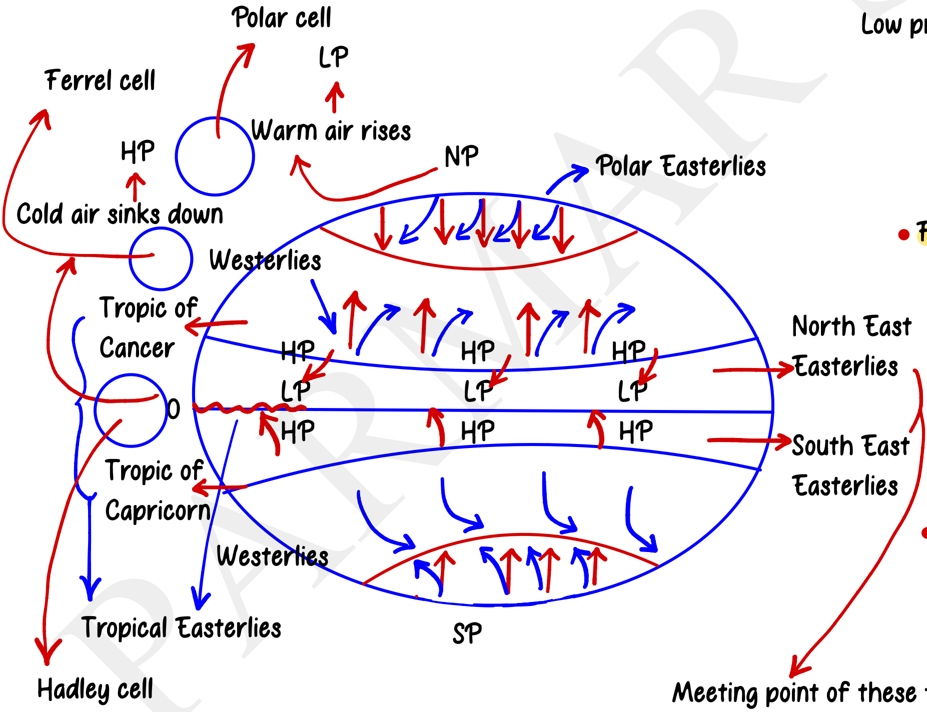

CURRENT
SHALLOW
LESS SALTY
WARM
COLD
SALTY
DEEP
CURRENT

- Pressure difference causes wind because

Warm air → Rises → Low pressure
Cold air → Sink → High pressure

- Wind: High pressure → Low pressure


High pressure
Low pressure


Polar cell
LP
Warm air rises
Ferrel cell
HP
Cold air sinks down
NP
Polar Easterlies
Westerlies
Tropic of Cancer
HP
HP
HP
LP
LP
LP
0
HP
HP
HP
Tropic of Capricorn
Westerlies
Tropical Easterlies
SP
Hadley cell
North East Easterlies
South East Easterlies

- Forces: Coriolis Force
  ↓
  Due to rotation

NH → Right
SH → Left

- Wind name: Due to direction of origin

Meeting point of these two zones is known as ITCZ Zone (Inter Tropical Convergence Zone) (NE + SE)

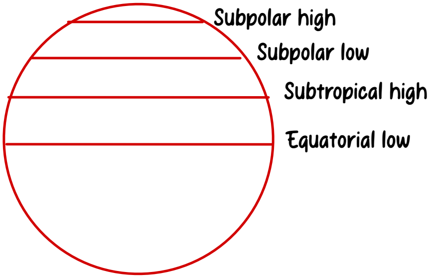
↓

Shifts upward to Tropic of Cancer in summer and shifts to Tropic of Capricorn during winter

Doldrum Zone is seen here

Here:

- Coriolis force is zero
- Winds relatively calm


Subpolar high
Subpolar low
Subtropical high
Equatorial low

Trade winds: Permanent winds

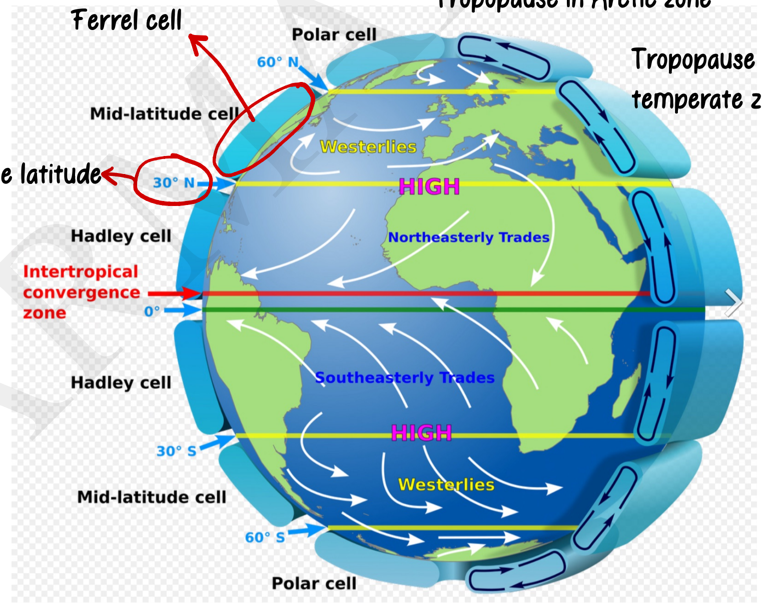
Easterlies (East direction) → Tropical, Polar

Westerlies (West direction)

- Horse latitude: seen in 30°N/30°S

Coriolis force → Max at poles → when at higher latitude, wind rotates a lot and blows parallel to isobar

Coriolis force → Zero at equator


Polar cell
60° N
Mid-latitude cell
Westerlies
30° N
HIGH
Hadley cell
Northeasterly Trades
Intertropical convergence zone
0°
Hadley cell
Southeasterly Trades
30° S
HIGH
Westerlies
Mid-latitude cell
60° S
Polar cell

Tropopause in Arctic zone

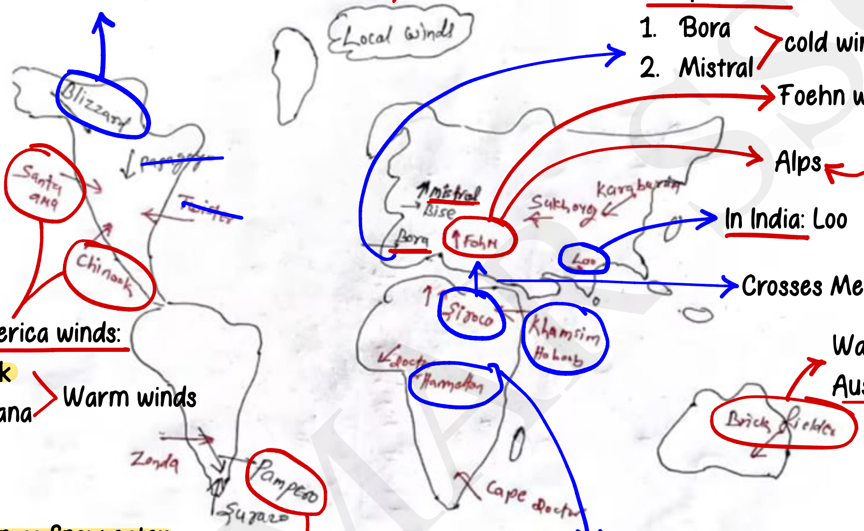
Ferrel cell

Tropopause in temperate zone

Horse latitude

- **Geostrophic winds**: winds that blow parallel to isobars

- **Isobars**: line connecting the points having same pressure


Local winds
Blizzard
Papagayo
Tehuantepec
Santa ana
Chinook
Mistral
Bise
Bora
Fohn
Sukhovey
Karaburan
Loo
Sirocco
Khamsin
Haboob
Doctor
Harmattan
Zonda
Pampero
Surazo
Cape Doctor
Brick fielder

Blowing only in local area

Cold winds

Europe winds:

1. Bora
2. Mistral

} cold winds

Foehn winds: warm winds

Blows in Alps

In India: Loo

Crosses Mediterranean Sea

Warm wind in Australia

North America winds:

1. Chinook
2. Santa ana

} Warm winds

- Also known as Snow eater
- It is a katabatic wind

Snow melts it

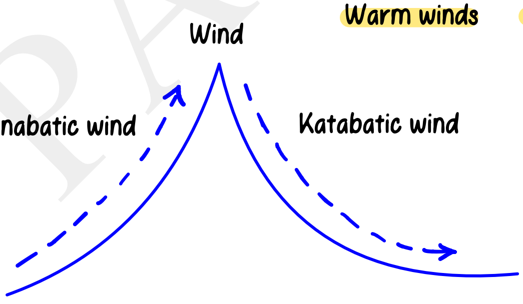
Cold wind that blows in South America

In Africa all the winds are warm/hot:

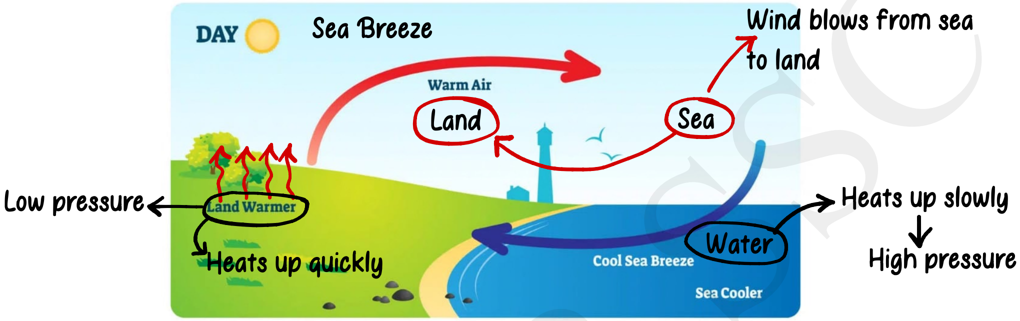
1. **Sirocco:** Starts from Sahara Desert, causes blood rain
2. **Khamsin:** it blows in Egypt
3. **Harmattan:** also known as **Doctor wind** because of Guinea Coast. This wind provides health benefits to local people

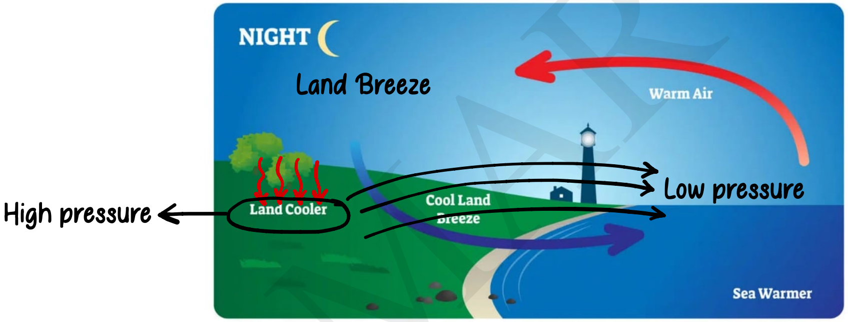
Local winds

Warm winds | Cold winds


Wind
Anabatic wind
Katabatic wind

LAND VS SEA BREEZE

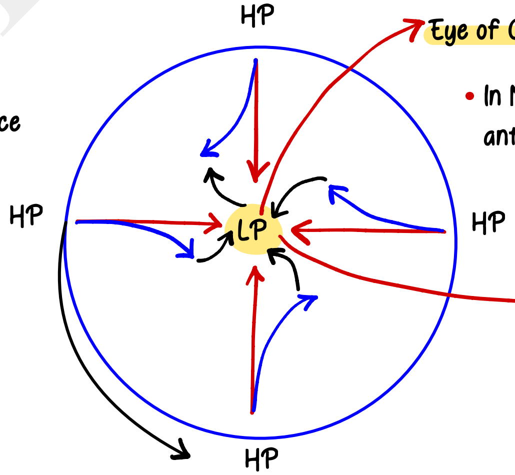

DAY
Sea Breeze
Wind blows from sea to land
Warm Air
Land
Sea
Low pressure
Land Warmer
Heats up quickly
Heats up slowly
High pressure
Water
Cool Sea Breeze
Sea Cooler


NIGHT
Land Breeze
Warm Air
High pressure
Land Cooler
Cool Land Breeze
Low pressure
Sea Warmer

- **Land**: heats up and cools down quickly
- **Water**: heats up and cool down slowly

Cyclones

- At Equator, the Coriolis force is zero → No cyclone


HP
HP
HP
HP
LP

Centre where wind meet is called **Eye of Cyclone**

- In NH, the wind will rotate anticlockwise

no clouds, calm area, no rainfall

Conditions favourable:

1. Large Sea Surface temperature
2. Coriolis force
3. Small variation in vertical wind speed
4. Pre-existing weak LP area

- During cyclone, Cumulonimbus clouds are formed → Causes heavy rain and thunderstorms

Cyclone at High Latitudes are caused due to Frontogenesis

↓

Fronts

↓

Two different air masses are formed/meet

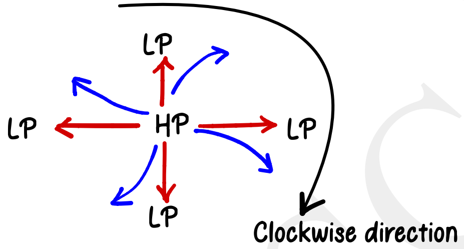
↓

Causes Extratropical/Temperate Cyclone

- Difference in Tropical and Temperate cyclone

Tropical	Temperate
Only in Sea	In land/sea
More destructible	Less destructible
Not frequent	More frequent
Flows East to West	Flows from West to East

Anticyclone: forms around high pressure


LP
LP
HP
LP
LP
Clockwise direction

	Cyclone	Anticlockwise
NH →	Anticlockwise	Clockwise
SH →	Clockwise	Anticlockwise

Different names of cyclones:

1. Atlantic Ocean: Hurricane
2. Australia: Willy-Willy
3. Western Pacific/South China Sea: Typhoon
4. Indian Ocean: Cyclone

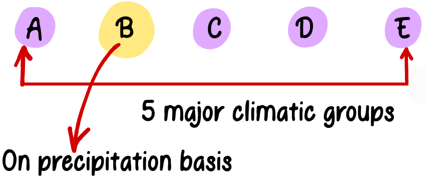
Koeppen Climatic Classification

- Weather: short term
- Climate: long term → Roughly 30 years data is taken

- Mediterranean Sea: Cs

Koeppen in 1918 → Empirical Climatic Classification

- Used capital and small letters
- Climatic groups represented with different codes


A
B
C
D
E
5 major climatic groups
On precipitation basis

Steppe
↑
S
↖
B
↙
W
↓
Desert

Koeppen's Classification

A: Tropical

B: Dry Climate

C: Warm Temperate

D: Cold Snow Forest

E: Polar type (cold)

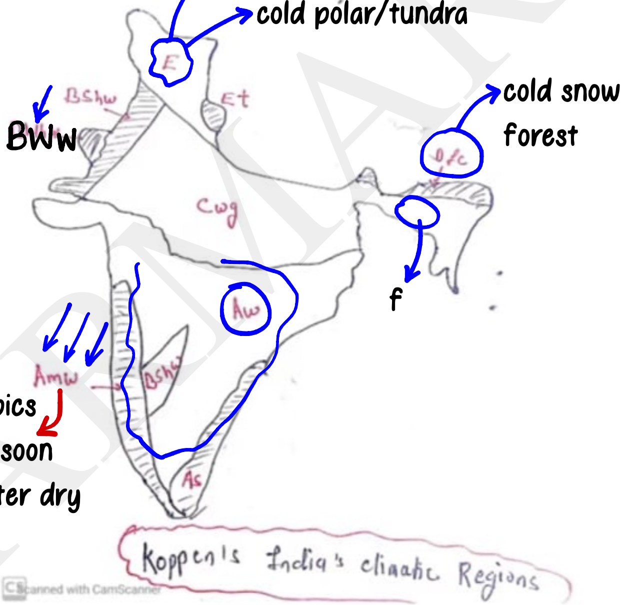
w: winter dry

s: summer dry

m: monsoon

f: full baarish

Tundra type of climate due to extreme conditions

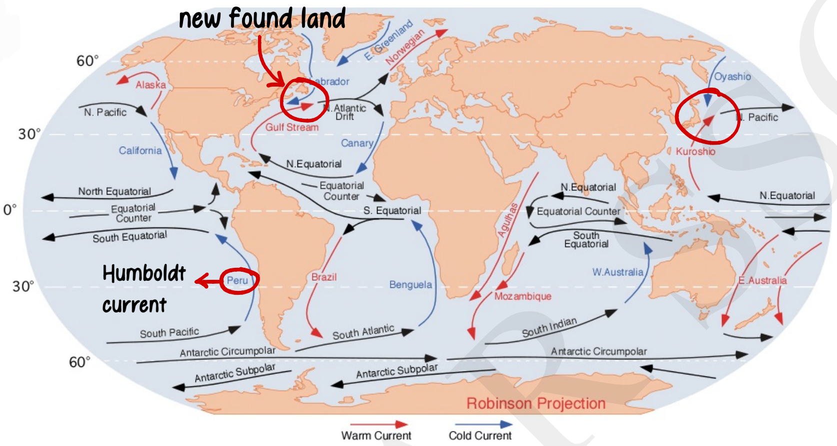


cold polar/tundra
E
BShw
Et
BWw
Dfc
cold snow forest
Cwg
f
Aw
Amw
BShw
As
Scanned with CamScanner

- Tropics
- Monsoon
- Winter dry

Koppen's India's climatic Regions

Ocean Currents


new found land
60°
30°
0°
30°
60°
Alaska
N. Pacific
California
North Equatorial
Equatorial Counter
South Equatorial
Labrador
Gulf Stream
N. Atlantic Drift
E. Greenland
Norwegian
Canary
N.Equatorial
Equatorial Counter
S. Equatorial
Humboldt current
Peru
Brazil
Benguela
South Pacific
South Atlantic
Antarctic Circumpolar
Antarctic Subpolar
Agulhas
Mozambique
N.Equatorial
Equatorial Counter
South Equatorial
W.Australia
South Indian
Antarctic Circumpolar
Oyashio
N. Pacific
Kuroshio
N.Equatorial
E.Australia
Robinson Projection
Warm Current
Cold Current

TRICK

B	P	company	G	O	L	F	W	C	California
Benguela	Peru		Greenland	Oyashio	Labrador	Falkland	West Australian Drift	Canary	California

Cold Ocean Current

Reasons of origination:

1. Heating by Sun
2. Wind
3. Density different
4. Coriolis force
5. Coastline of continents

- Cold air: water holding capacity less
- Warm air: water holding capacity high

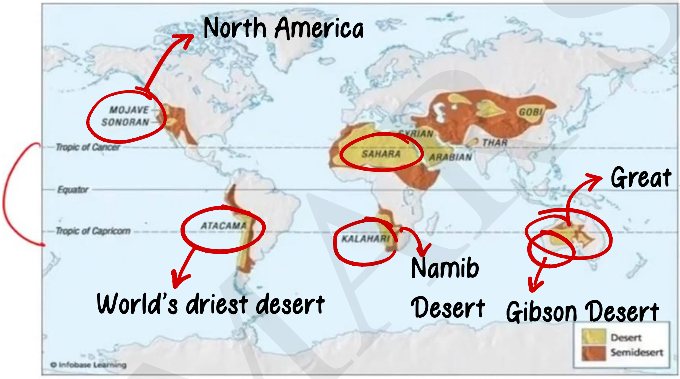
Types of Ocean Currents

- Surface: 10%
- Deep Sea: 90%

Effects:

1. Warm ocean current + cold ocean current → Best fishing zones
↓
Creates foggy conditions: worst for Harbouring

2. Cold ocean current: creates desert
↓
Max. desert seen on Western side of the continent


MOJAVE
SONORAN
Tropic of Cancer
Equator
Tropic of Capricorn
SYRIAN
SAHARA
ARABIAN
THAR
GOBI
ATACAMA
KALAHARI
Desert
Semidesert
© Infobase Learning

North America

Great Australian Desert

World's driest desert

Namib Desert

Gibson Desert

- Grasslands: areas where there is not much precipitation (Rainfall)

1. In early 1900's, which German Climatologist divided the world's climate into different category based on temperature, amount of rainfall and the time of year when rainfall occurs ?

(SSC CHSL 07/06/2022 Afternoon)

1900 के दशक की शुरुआत में, किस जर्मन जलवायु विज्ञानी ने विश्व की जलवायु को तापमान, वर्षा की मात्रा और वर्ष के उस समय जब वर्षा होती है, के आधार पर विभिन्न श्रेणियों में विभाजित किया था?

(a) Michael Wille
[✓ (b) Wladimir Koppen]
(c) Rudolf Geiger
(d) Alfred Wegener

a) माइकल विले
b) व्लादिमीर कोपेन
c) रुडोल्फ गीगर
d) अल्फ्रेड वेगेनर

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

2. ______ is concerned with constructing records of past climates and climatic events by analysis of tree growth characteristics, especially growth rings? (SSC CGL 12/04/2022 Afternoon Shift)

______ वृक्ष विकास विशेषताओं, विशेष रूप से विकास वलय के विश्लेषण द्वारा पिछली जलवायु और जलवायु घटनाओं के रिकॉर्ड बनाने से संबंधित है

(a) Bioclimatology
(b) Historical – Climatology
(c) Geo Climatology
[✓ (d) Dendroclimatology]

a) जैवजलवायुविज्ञान
b) ऐतिहासिक - जलवायु विज्ञान
c) भू जलवायु विज्ञान
d) डेंड्रोक्लाइमेटोलॉजी

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

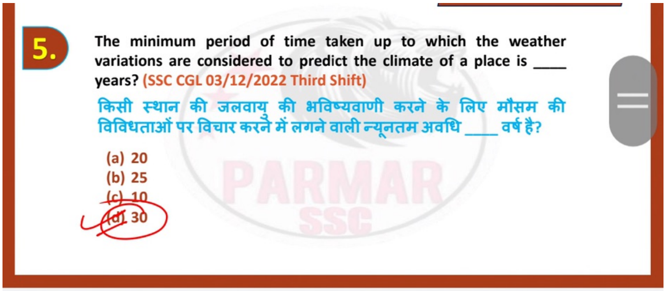
3. The climate of India is described as which of the following types?

(SSC MTS 26/07/2022 Morning)

भारत की जलवायु को निम्नलिखित में से किस प्रकार के रूप में वर्णित किया गया है?

(a) Mediterranean
(b) Temperate
[✓ (c) Monsoon]
(d) Polar

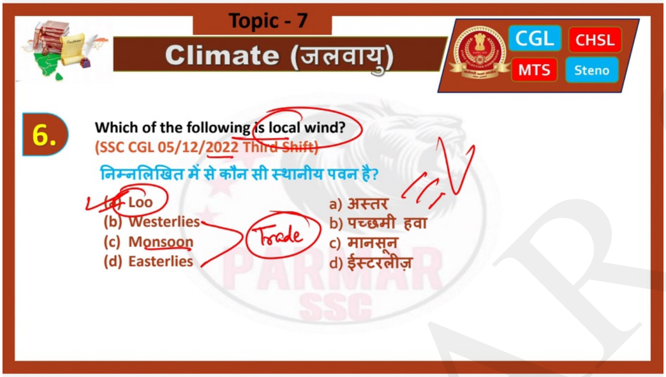
a) आभ्यंतरिक
b) शीतोष्ण
c) मानसून
d) ध्रुवीय



5. The minimum period of time taken up to which the weather variations are considered to predict the climate of a place is ____ years? (SSC CGL 03/12/2022 Third Shift)

किसी स्थान की जलवायु की भविष्यवाणी करने के लिए मौसम की विविधताओं पर विचार करने में लगने वाली न्यूनतम अवधि ____ वर्ष है?

(a) 20
(b) 25
(c) 10
[✓ (d) 30]



Topic - 7

Climate (जलवायु)

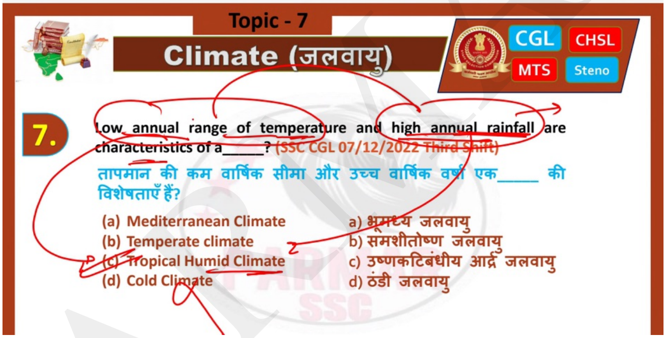
CGL CHSL MTS Steno

6. Which of the following is local wind? (SSC CGL 05/12/2022 Third Shift)

निम्नलिखित में से कौन सी स्थानीय पवन है?

[✓ (a) Loo]	a) अस्तर
(b) Westerlies	b) पच्छमी हवा
(c) Monsoon	c) मानसून
(d) Easterlies	d) ईस्टरलीज़

Trade



Topic - 7

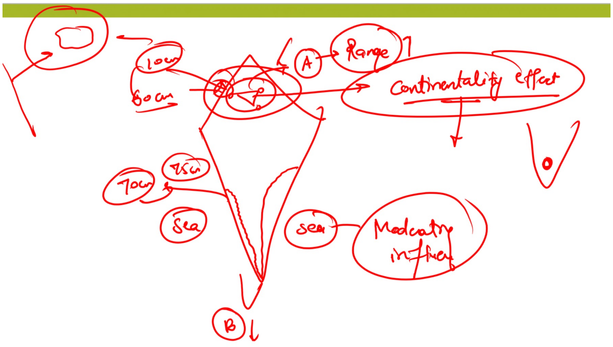
Climate (जलवायु)

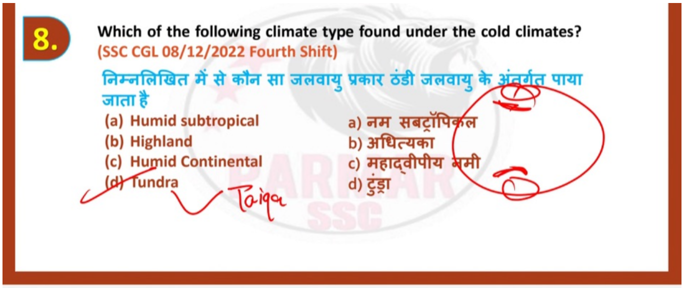
CGL CHSL MTS Steno

7. Low annual range of temperature and high annual rainfall are characteristics of a_____? (SSC CGL 07/12/2022 Third Shift)

तापमान की कम वार्षिक सीमा और उच्च वार्षिक वर्षा एक_____ की विशेषताएँ हैं?

(a) Mediterranean Climate	a) भूमध्य जलवायु
(b) Temperate climate	b) समशीतोष्ण जलवायु
[✓ (c) Tropical Humid Climate]	c) उष्णकटिबंधीय आर्द्र जलवायु
(d) Cold Climate	d) ठंडी जलवायु





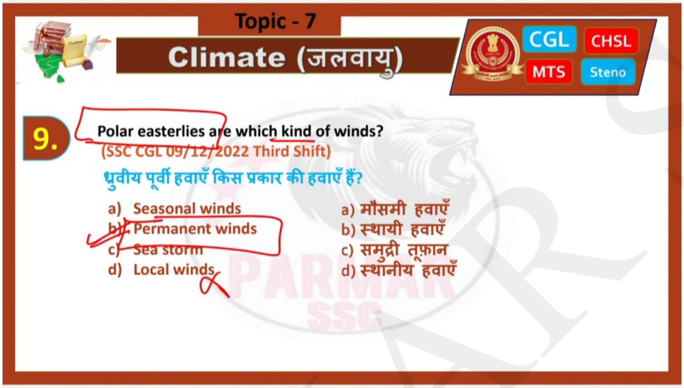
8. Which of the following climate type found under the cold climates?
(SSC CGL 08/12/2022 Fourth Shift)

निम्नलिखित में से कौन सा जलवायु प्रकार ठंडी जलवायु के अंतर्गत पाया जाता है

(a) Humid subtropical
(b) Highland
(c) Humid Continental
(d) Tundra

a) नम सबट्रॉपिकल
b) अधित्यका
c) महाद्वीपीय नमी
d) टुंड्रा

Taiga



Topic - 7

Climate (जलवायु)

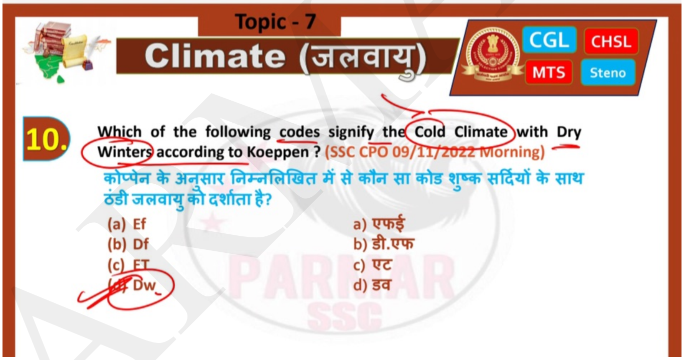
CGL CHSL MTS Steno

9. Polar easterlies are which kind of winds?
(SSC CGL 09/12/2022 Third Shift)

ध्रुवीय पूर्वी हवाएँ किस प्रकार की हवाएँ हैं?

a) Seasonal winds
b) Permanent winds
c) Sea storm
d) Local winds

a) मौसमी हवाएँ
b) स्थायी हवाएँ
c) समुद्री तूफ़ान
d) स्थानीय हवाएँ



Topic - 7

Climate (जलवायु)

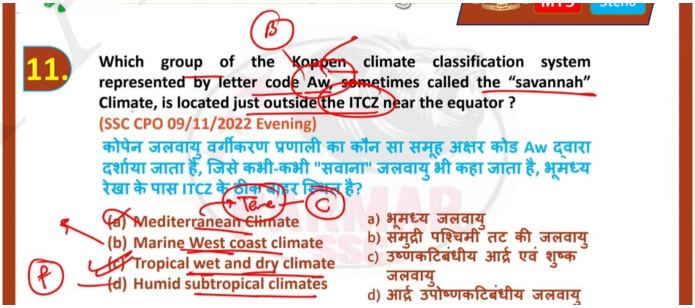
CGL CHSL MTS Steno

10. Which of the following codes signify the Cold Climate with Dry Winters according to Koeppen ? (SSC CPO 09/11/2022 Morning)

कोप्पेन के अनुसार निम्नलिखित में से कौन सा कोड शुष्क सर्दियों के साथ ठंडी जलवायु को दर्शाता है?

(a) Ef
(b) Df
(c) ET
(d) Dw

a) एफई
b) डी.एफ
c) एट
d) डव



B

11. Which group of the Koppen climate classification system represented by letter code Aw, sometimes called the "savannah" Climate, is located just outside the ITCZ near the equator ?
(SSC CPO 09/11/2022 Evening)

कोपेन जलवायु वर्गीकरण प्रणाली का कौन सा समूह अक्षर कोड Aw द्वारा दर्शाया जाता है, जिसे कभी-कभी "सवाना" जलवायु भी कहा जाता है, भूमध्य रेखा के पास ITCZ के ठीक बाहर स्थित है?

C

(a) Mediterranean Climate
(b) Marine West coast climate
(c) Tropical wet and dry climate
(d) Humid subtropical climates

a) भूमध्य जलवायु
b) समुद्री पश्चिमी तट की जलवायु
c) उष्णकटिबंधीय आर्द्र एवं शुष्क जलवायु
d) आर्द्र उपोष्णकटिबंधीय जलवायु

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

12. Which of the following is a temperate marine climate with substantial rainfall in all seasons? (SSC CPO 10/11/2022 Morning)

निम्नलिखित में से कौन सी समशीतोष्ण समुद्री जलवायु है जिसमें सभी मौसमों में पर्याप्त वर्षा होती है?

(a) Am	a) पूर्वाहन
(b) BSh	b) बीएसएच
(c) BSk	c) बी.एस.के
[✓ (d) Cfb]	d) सीएफबी

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

BS W

13. Which of the following pairs of type of climate – area is NOT correct?

I. Semi-arid steppe climate – Punjab

II. Monsoon with dry summer – Corromandel coast of Tamil Nadu

(SSC CPO 10/11/2022 Evening)

जलवायु-क्षेत्र के प्रकार का निम्नलिखित में से कौन-सा युग्म सही नहीं है?

I. अर्ध-शुष्क मैदानी जलवायु - पंजाब

II. शुष्क गर्मी के साथ मानसून - तमिलनाडु का कोरोमंडल तट

TN

(a) Only I	a) केवल मैं
(b) Neither I nor II	b) न तो मैं और न ही द्वितीय
(c) Only II	c) केवल द्वितीय
[✓ (d) Both I and II]	d) I और II दोनों

14. The cold snow forest climate is found largely in the continental region in the Northern Hemisphere between _____ northern latitudes in Europe, Asia and North America? (SSC CPO 11/11/2022 Morning)

ठंडी बर्फीली वन जलवायु बड़े पैमाने पर यूरोप, एशिया और उत्तरी अमेरिका में _____ उत्तरी अक्षांशों के बीच उत्तरी गोलार्ध में महाद्वीपीय क्षेत्र में पाई जाती है?

[✓ (a) 40° - 70°]

(b) 30° - 50° → C

(c) 80° 110°

(d) 15° - 20° → A

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

15. Which of the following regions have long, cold winters with high winds and average temperatures below freezing for six to ten months of the year? (SSC CPO 11/11/2022 Evening)

निम्नलिखित में से किस क्षेत्र में तेज़ हवाओं के साथ लंबी, ठंडी सर्दियाँ होती हैं और वर्ष के छह से दस महीनों तक औसत तापमान शून्य से नीचे रहता है?

(a) Mediterranean Region	a) मेडिटरेनियन क्षेत्र
(b) Southern Australian Region	b) दक्षिणी ऑस्ट्रेलियाई क्षेत्र
[✓ (c) Tundra Region]	c) टुंड्रा क्षेत्र
(d) Tropical Region	d) उष्णकटिबंधीय क्षेत्र

16. The minimum temperature of the day occur generally_______.
(SSC MTS 07/07/2022 Evening)

दिन का न्यूनतम तापमान सामान्यतः_______ होता है।

- (a) In the evening — a) शाम के समय
- (b) At night — b) रात में
- (c) In the afternoon max — c) दोपहर को
- [✓ (d) In the early morning] — d) सुबह में

17. According to Koeppan's Scheme, which type of climate is denoted by 'Cwg' in India. (SSC CGL 18/07/2023 Second Shift)

कोप्पन की योजना के अनुसार, भारत में 'Cwg' द्वारा किस प्रकार की जलवायु को दर्शाया जाता है? BS

- (a) Semi-arid steppe climate — a) अर्धशुष्क मैदानी जलवायु
- ~~(b) Monsoon with dry summer~~ — b) शुष्क गर्मी के साथ मानसून
- (c) Polar Type E — c) ध्रुवीय प्रकार
- [✓ (d) Monsoon with dryer winter] — d) शुष्क शीत ऋतु के साथ मानसून

Topic - 7
Climate (जलवायु)

CGL CHSL MTS Steno

18. In how many agro-climatic zones has Tamil Nadu been Classified?
(SSC CGL 25/07/2023 Third Shift)

तमिलनाडु को कितने कृषि-जलवायु क्षेत्रों में वर्गीकृत किया गया है?

- (a) 5
- [✓ (b) 7]
- (c) 3
- (d) 9

Topic - 7
Climate (जलवायु)

CGL CHSL MTS Steno

19. Which climate zone has an average temperature of over 64°F(18° C) throughout the year and more than 59 inches rainfall each year?
(SSC CHSL 02/06/2022 Afternoon)

किस जलवायु क्षेत्र में पूरे वर्ष औसत तापमान 64°F(18°C) से अधिक होता है और प्रत्येक वर्ष 59 इंच से अधिक वर्षा होती है?

- [✓ (a) Tropical Zone] — a) उष्णकटिबंधीय क्षेत्र
- (b) Temperate Zone ✗ — b) शीतोष्ण क्षेत्र
- (c) Dry Zone ✗ — c) शुष्क क्षेत्र
- (d) Continental Zone ✗ — d) महाद्वीपीय क्षेत्र

20. Which type of climate do the two island regions of India, Lakshadweep and Andaman and Nicobar Islands experience?
(SSC CHSL 06/06/2022 Morning)

भारत के दो द्वीप क्षेत्र, लक्षद्वीप और अंडमान और निकोबार द्वीप समूह किस प्रकार की जलवायु का अनुभव करते हैं?

(a) Humid subtropical climate	a) आर्द्र उपोष्णकटिबंधीय जलवायु
(b) ~~Hot semi-arid climate~~	b) गर्म-अर्धशुष्क जलवायु
[✓ (c) Tropical Warm Climate]	c) उष्णकटिबंधीय गर्म जलवायु
(d) Subtropical highland Climate	d) उपोष्णकटिबंधीय उच्चभूमि जलवायु

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

21. What is the name of zone where trade winds converge?
(SSC CHSL 09/06/2022 Afternnon Shift)

उस क्षेत्र का क्या नाम है जहाँ व्यापारिक पवनें एकत्रित होती हैं?

(a) Forest zone	a) वन क्षेत्र
(b) Intra-terrestrial zone	b) अंतर-स्थलीय क्षेत्र
(c) Intra-continental convergence zone	c) अंतरमहाद्वीपीय अभिसरण क्षेत्र
[✓ (d) Intertropical convergence zone]	d) अंतरउष्णकटिबंधीय अभिसरण क्षेत्र

Topic - 7

Climate (जलवायु)

CGL CHSL MTS Steno

22. According to Kopann's climate classification scheme, dry climates are subdivided using the capital letter S for semi-arid regions or steppe and W for ____ region ? (SSC CHSL 09/06/2022 Evening Shift)

कोपन्न की जलवायु वर्गीकरण योजना के अनुसार, शुष्क जलवायु को अर्ध-शुष्क क्षेत्रों या स्टेपी के लिए बड़े अक्षर S और ____ क्षेत्र के लिए W का उपयोग करके उप-विभाजित किया जाता है?

(a) Highland	a) अधित्यका
[✓ (b) Desert]	b) रेगिस्तान
(c) Wind dry	c) शुष्क हवा
(d) Wet	d) गीला

23. Which of the following is INCORRECTLY matched?
(SSC CGL 18/07/2023 fourth Shift)

निम्नलिखित मे से कौन सा गलत सुमेलित है?

[✓ (a) Montane Climate – Uttar Pradesh, Bihar and Jharkhand]
(b) Hot desserts, arid Climate – Rajasthan and Some parts of Gujarat
(c) Tropical Monsoon Climate – The Western Ghats, the Malabar Coast and Southern Assam
(d) Tropical Semi-arid (Steppe) climate – Karnataka, Central Maharashtra, some parts of Tamil Nadu and Andhra Pradesh

a) पर्वतीय जलवायु - उत्तर प्रदेश, बिहार और झारखंड
b) गर्म मिठाइयाँ, शुष्क जलवायु - राजस्थान और गुजरात के कुछ हिस्से
c) उष्णकटिबंधीय मानसून जलवायु - पश्चिमी घाट, मालाबार तट और दक्षिणी असम
d) उष्णकटिबंधीय अर्ध-शुष्क (स्टेपी) जलवायु - कर्नाटक, मध्य महाराष्ट्र, तमिलनाडु और आंध्र प्रदेश के कुछ हिस्से

24. A storm that occur due to difference in temperature and pressure of air is called ______.

तापमान और हवा के दबाव में अंतर के कारण आने वाले तूफान को ______ कहा जाता है।

LP

anticlo

E → W

(a) Tsunami	a) सुनामी
(b) Cyclone ✓	b) चक्रवात
(c) Earthquake	c) भूकंप
(d) None of the above	d) इनमे से कोई भी नहीं

25. The western cyclone disturbance originates over? (SSC CGL 26/07/2023 Third Shift)

पश्चिमी चक्रवात विक्षोभ कहाँ से उत्पन्न होता है?

(a) Arabian Sea	a) अरब सागर
(b) Pacific Ocean	b) प्रशांत महासागर
(c) Bay of Bengal	c) बंगाल की खाड़ी
(d) The Mediterranean ✓	d) भूमध्यसागर

Topic - 7

Cyclone (चक्रवात)

CGL CHSL MTS Steno

26. The centre of cyclone is a calm area. It is called the ____ of the storm ? (SSC CGL 24/07/2023 Fourth Shift)

चक्रवात का केंद्र एक शांत क्षेत्र है. इसे तूफ़ान का ____ कहा जाता है?

(a) Base	a) आधार
(b) Focal point	b) केंद्र बिंदु
(c) Eye ✓	c) आँख
(d) Trigger point	d) सतर्कता बिन्दु

Topic - 7

Cyclone (चक्रवात)

CGL CHSL MTS Steno

27. Which of the following cyclone did NOT hit India during the years 2021-2022? (SSC CGL 20/07/2023 First Shift)

वर्ष 2021-2022 के दौरान निम्नलिखित में से कौन सा चक्रवात भारत में नहीं आया?

Yulia

(a) Gulab ✓	a) गुलाब
(b) Julia ✓	b) जूलिया
(c) Yaas ✓	c) हाँ
(d) Tauktae ✓	d) ताउते

28. In the context of India, Tropical Cyclones originate over the _____?
(SSC CGL 05/12/2022 Third Shift)

भारत के संदर्भ में, उष्णकटिबंधीय चक्रवात _____ पर उत्पन्न होते हैं?

(a) Arabian Sea	a) अरब सागर AS
(b) Pacific Ocean	b) प्रशांत महासागर
[✓ (c) Bay of Bengal]	c) बंगाल की खाड़ी
(d) Mediterranean Sea	d) भूमध्य - सागर

Topic - 7

Cyclone (चक्रवात)

CGL CHSL MTS Steno

29. A cyclone is known by different names in different parts of the world. In Philippines it is called_______.
(SSC CGL 13/12/2022 Third Shift)

दुनिया के अलग-अलग हिस्सों में चक्रवात को अलग-अलग नामों से जाना जाता है। फिलीपींस में इसे_______ कहा जाता है।

(a) Willy-willy	a) विली-विली
(b) Hurricane	b) चक्रवात
[✓ (c) Typhoon]	c) आंधी
(d) Mango shower	d) आम की बौछार

Topic - 7

Cyclone (चक्रवात)

CGL CHSL MTS Steno

30. In early November, the low pressure condition shifts over the Bay of Bengal. The transfer is related to cyclonic low pressure, which originates over _______ ? (SSC MTS 13/07/2022 Morning Shift)

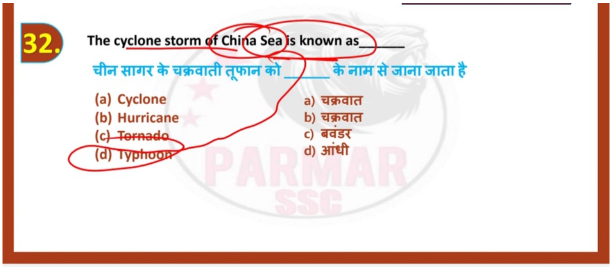
नवंबर की शुरुआत में, निम्न दबाव की स्थिति बंगाल की खाड़ी पर स्थानांतरित हो जाती है। स्थानांतरण चक्रवाती निम्न दबाव से संबंधित है, जो _______ पर उत्पन्न होता है?

[✓ (a) Andaman Sea]	a) अंडमान सागर
(b) Sea of Japan	b) जापान का सागर
(c) Caspian Sea	c) कैस्पियन सागर
(d) Pacific Ocean	d) प्रशांत महासागर

31. In India from where do the tropical cyclones, which enter the Indian subcontinent from the west and the northwest during the winter months, originate? (SSC CHSL 08/06/2022 Morning Shift)

भारत में उष्णकटिबंधीय चक्रवात, जो सर्दियों के महीनों के दौरान पश्चिम और उत्तर-पश्चिम से भारतीय उपमहाद्वीप में प्रवेश करते हैं, कहाँ से उत्पन्न होते हैं?

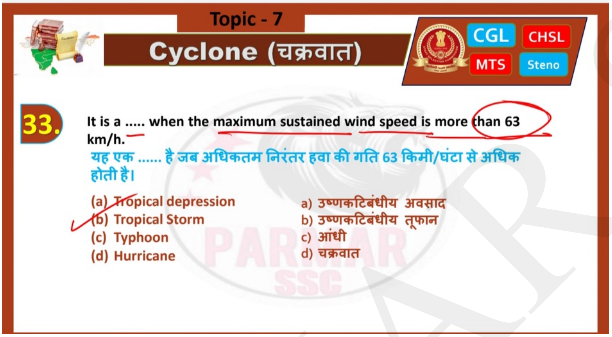
(a) Over the Gulf of Khambhat	a) खंभात की खाड़ी के ऊपर
(b) Over the Arabian Sea	b) अरब सागर के ऊपर
(c) Over the Gulf of Mannar	c) मन्नार की खाड़ी के ऊपर
[✓ (d) Over the Mediterranean Sea]	d) भूमध्य सागर के ऊपर



32. The cyclone storm of China Sea is known as______

चीन सागर के चक्रवाती तूफान को ______ के नाम से जाना जाता है

(a) Cyclone	a) चक्रवात
(b) Hurricane	b) चक्रवात
(c) Tornado	c) बवंडर
(d) Typhoon	d) आंधी



Topic - 7

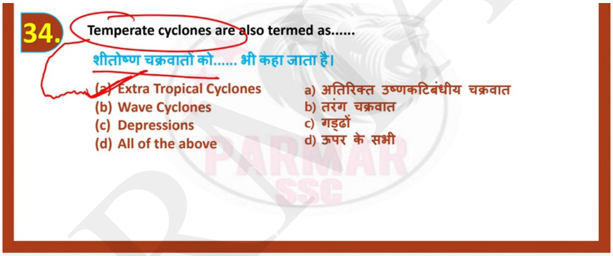
Cyclone (चक्रवात)

CGL
CHSL
MTS
Steno

33. It is a ..... when the maximum sustained wind speed is more than 63 km/h.

यह एक ...... है जब अधिकतम निरंतर हवा की गति 63 किमी/घंटा से अधिक होती है।

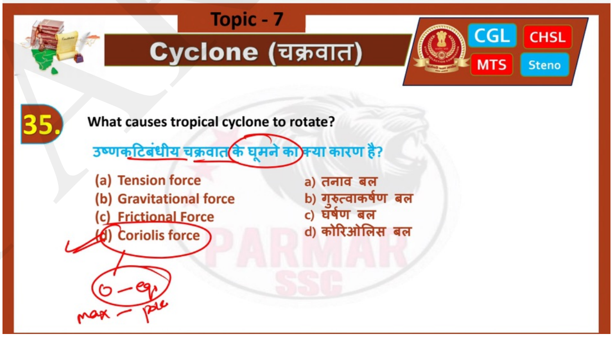
(a) Tropical depression	a) उष्णकटिबंधीय अवसाद
(b) Tropical Storm	b) उष्णकटिबंधीय तूफान
(c) Typhoon	c) आंधी
(d) Hurricane	d) चक्रवात



34. Temperate cyclones are also termed as......

शीतोष्ण चक्रवातों को...... भी कहा जाता है।

(a) Extra Tropical Cyclones	a) अतिरिक्त उष्णकटिबंधीय चक्रवात
(b) Wave Cyclones	b) तरंग चक्रवात
(c) Depressions	c) गड्ढों
(d) All of the above	d) ऊपर के सभी



Topic - 7

Cyclone (चक्रवात)

CGL
CHSL
MTS
Steno

35. What causes tropical cyclone to rotate?

उष्णकटिबंधीय चक्रवात के घूमने का क्या कारण है?

(a) Tension force	a) तनाव बल
(b) Gravitational force	b) गुरुत्वाकर्षण बल
(c) Frictional Force	c) घर्षण बल
(d) Coriolis force	d) कोरिओलिस बल

0 — eq
max — pole

36. Identify the correct statement about cyclones.

चक्रवातों के बारे में सही कथन पहचानें।

Ld

(a) High speed winds circulate around a high pressure region
(b) The coastline of India is not vulnerable to cyclone
(c) The wind direction is clockwise in southern hemisphere and anticlockwise in northern hemisphere
(d) The wind direction is clockwise in both hemispheres

a) उच्च दबाव वाले क्षेत्र के चारों ओर तेज़ गति वाली हवाएँ घूमती हैं
b) भारत की तटरेखा चक्रवात के प्रति संवेदनशील नहीं है
c) हवा की दिशा दक्षिणी गोलार्ध में दक्षिणावर्त और उत्तरी गोलार्ध में वामावर्त होती है
d) दोनों गोलार्धों में हवा की दिशा दक्षिणावर्त है

37. Which of the following is warm current?
(SSC MTS 12/07/2022 Afternoon Shift)

निम्नलिखित में से कौन गर्म धारा है?

Best

(a) Labrador Current	a) लैब्राडोर धारा
(b) Falkland Current	b) फ़ॉकलैंड धारा
(c) Canary Current	c) कैनरी धारा
(d) Gulf Stream	d) गल्फ स्ट्रीम

Topic - 7

Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

38. Which of the following is warm ocean current of the Pacific Ocean?

निम्नलिखित में से कौन प्रशांत महासागर की गर्म महासागरीय धारा है?

Kyosho

(a) Kuroshio Current	a) कुरोशियो वर्तमान
(b) Humboldt Current Peru-cold	b) हम्बोल्ट धारा
(c) Canaries Current Cold	c) कैनरीज़ करंट
(d) Labrador Current Cold	d) लैब्राडोर धारा

Topic - 7

Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

39. Gulf stream is which type of current?

गल्फ स्ट्रीम किस प्रकार की धारा है?

(a) Warm Current	a) गर्म धारा
(b) Cold Current	b) ठंडी धारा
(c) Warm and Cold Current	c) गर्म और ठंडी धारा
(d) None of the above	d) इनमे से कोई भी नहीं

40. Labrador Current is which type of current?

लैब्राडोर धारा किस प्रकार की धारा है?

- (a) Canary's Current
- [✓ (b) Cold Current]
- (c) Warm Current
- (d) None of the Above

- a) कैनरी की धारा
- b) ठंडी धारा
- c) गर्म धारा
- d) इनमे से कोई भी नहीं

Topic - 7

Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

41. Which one of the given ocean currents is the largest and most powerful surface current on the earth?

दी गई महासागरीय धाराओं में से कौन सी पृथ्वी पर सबसे बड़ी और सबसे शक्तिशाली सतही धारा है?

- (a) California Current
- [✓ (b) Antarctic Circumpolar Current]
- (c) Florida Current
- (d) None of these

- a) कैलिफोर्निया वर्तमान
- b) अंटार्कटिक सर्कपोलर धारा
- c) फ्लोरिडा वर्तमान
- d) इनमें से कोई नहीं

42. Which of the following currents is a Cold ocean Current ?

निम्नलिखित में से कौन सी धारा ठंडी महासागरीय धारा है?

- (a) Florida Current
- (b) Norwegian Current
- (c) Irminger Current
- [✓ (d) California Current]

- a) फ्लोरिडा वर्तमान
- b) नॉर्वेजियन करंट
- c) इर्मिंगर धारा
- d) कैलिफोर्निया वर्तमान

43. Where do warm ocean currents move?

गर्म महासागरीय धाराएँ कहाँ चलती हैं?

- (a) Indonesia to Philippines
- (b) Sri Lanka to Indonesia
- [✓ (c) Away from equator toward the poles]
- (d) None of these

- a) इंडोनेशिया से फिलीपींस तक
- b) श्रीलंका से इंडोनेशिया तक
- c) भूमध्य रेखा से दूर ध्रुवों की ओर
- d) इनमें से कोई नहीं

Topic - 3

Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

44. The rhythmic rise and fall of ocean water twice in a day called a __________. (SSC MTS 20/07/2022 Afternoon)

एक दिन में दो बार समुद्र के पानी के लयबद्ध उत्थान और पतन को __________ कहा जाता है।

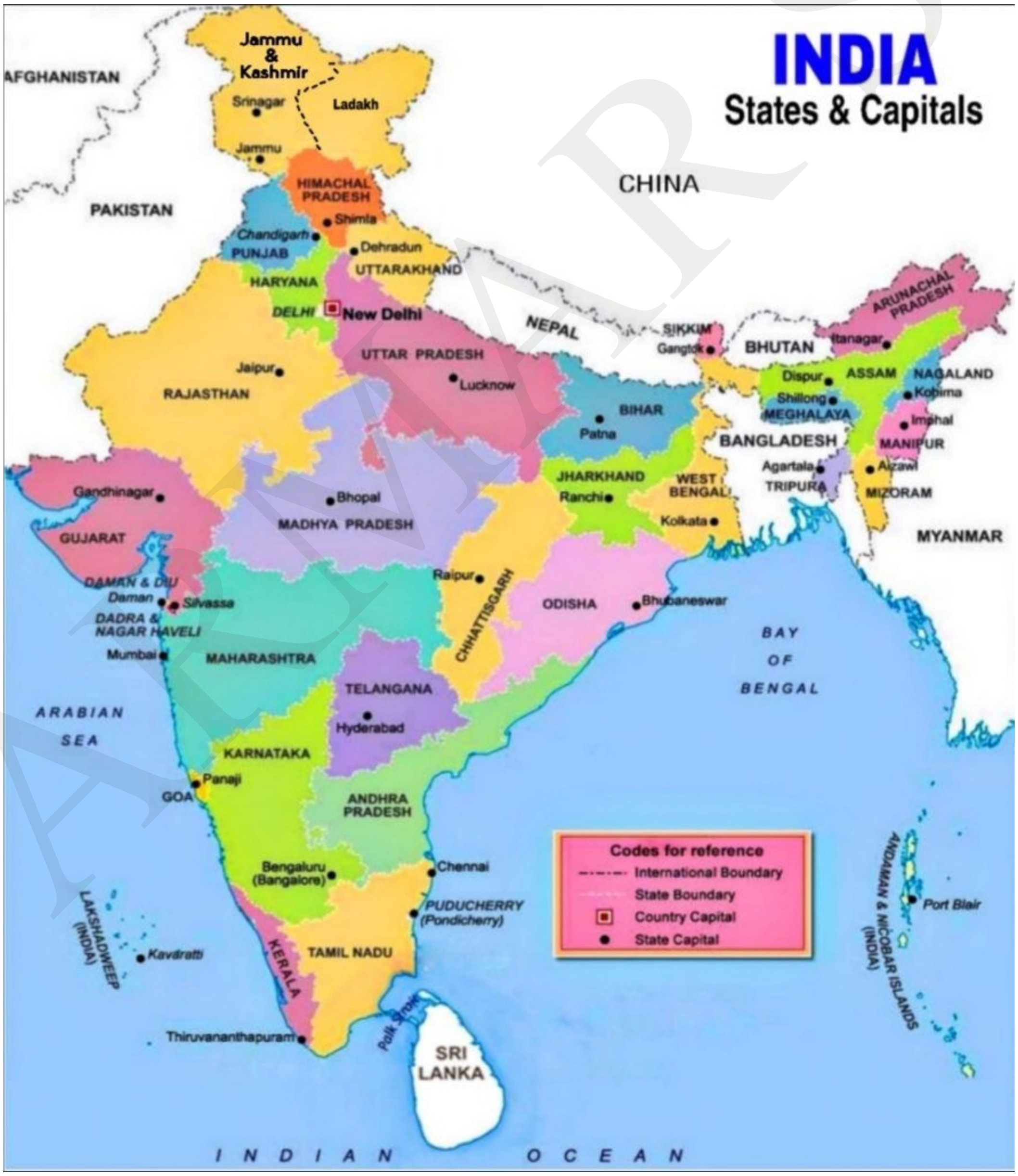
- (a) Fall
- [✓ (b) Tide]
- (c) Wave
- (d) Current

- a) गिरना
- b) ज्वार-भाटा
- c) लहर
- d) मौजूदा

Gyre

Circulatory pattern

INDIA AND IT'S BOUNDARY


INDIA
States & Capitals
AFGHANISTAN
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
MYANMAR
SRI LANKA
Jammu & Kashmir
Srinagar
Jammu
Ladakh
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
Dehradun
UTTARAKHAND
HARYANA
DELHI
New Delhi
UTTAR PRADESH
Lucknow
RAJASTHAN
Jaipur
SIKKIM
Gangtok
ARUNACHAL PRADESH
Itanagar
Dispur
ASSAM
NAGALAND
Kohima
Shillong
MEGHALAYA
Imphal
MANIPUR
Agartala
TRIPURA
Aizawl
MIZORAM
BIHAR
Patna
JHARKHAND
Ranchi
WEST BENGAL
Kolkata
Gandhinagar
GUJARAT
Bhopal
MADHYA PRADESH
Raipur
CHHATTISGARH
ODISHA
Bhubaneswar
DAMAN & DIU
Daman
Silvassa
DADRA & NAGAR HAVELI
Mumbai
MAHARASHTRA
TELANGANA
Hyderabad
ARABIAN SEA
BAY OF BENGAL
KARNATAKA
Panaji
GOA
ANDHRA PRADESH
Chennai
Bengaluru (Bangalore)
PUDUCHERRY (Pondicherry)
LAKSHADWEEP (INDIA)
Kavaratti
KERALA
TAMIL NADU
Thiruvananthapuram
Palk Strait
ANDAMAN & NICOBAR ISLANDS (INDIA)
Port Blair
Codes for reference
International Boundary
State Boundary
Country Capital
State Capital
INDIAN OCEAN

- India was a part of Gondwanaland

- India in terms of area is in the 7th position
- 1st: Russia
- 2nd: Canada
- 3rd: China
- 4th: USA
- 5th: Brazil
- 6th: Australia
- 8th: Argentina

- Smallest: Vatican City

- India occupies 2.4% of total world's land area

- Population is 17% world's total population

Time Zones

- Russia: 11
- USA: 4
- Max. in France: 12 (because of many territories)

- India has total state: 28
- Total UTs: 8
- North-South extent: 3214 km
- West-East: 2933 km
- Latitudinal extent: 8°4'–37°6' → Difference: ~30°
- Longitudinal extent: 68°7'–97°25' → Difference: ~30°

- Difference b/w every latitude is same: 111 km
- Difference b/w every longitude is varying

  ↓

  Max. at the equator
  Zero at the poles

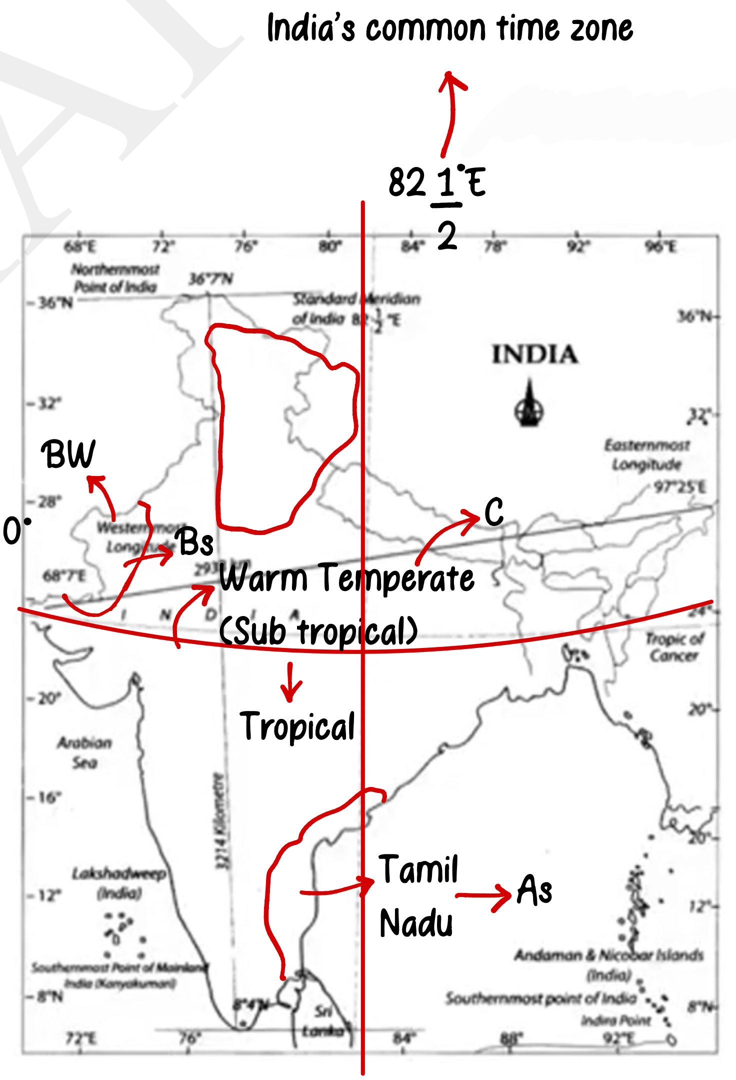
Time difference between Gujarat and Arunachal: 30°

= 30 x 4

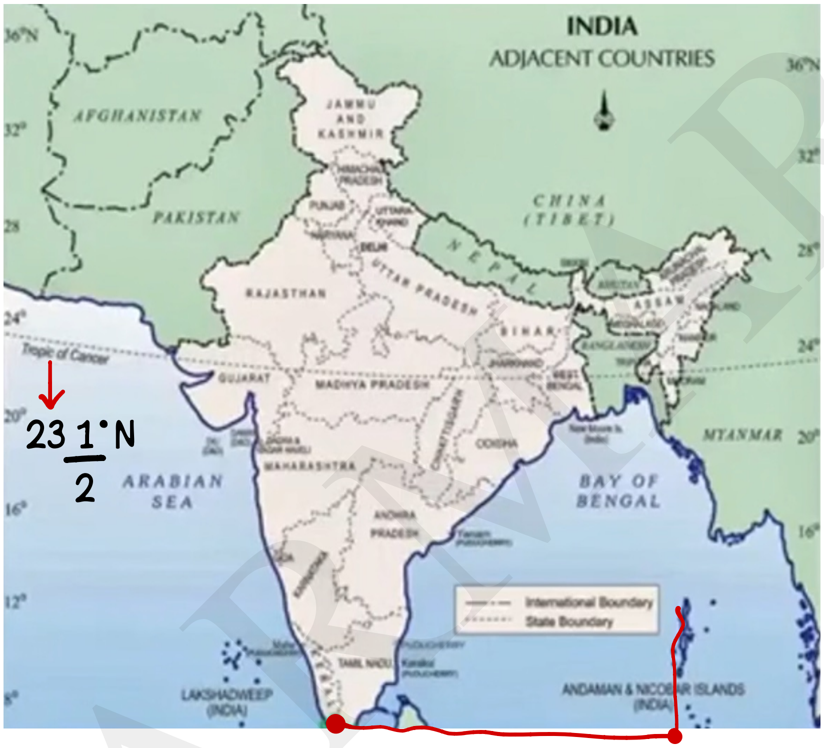
= 120 mins = 2 hrs

1° = 4 mins

15° = 1 hr


India's common time zone
$82\frac{1}{2}$°E
68°E
72°
76°
80°
84°
78°
92°
96°E
Northernmost Point of India
36°7'N
36°N
Standard Meridian of India $82\frac{1}{2}$°E
INDIA
32°
Eastern most Longitude
97°25'E
28°
BW
Western most Longitude
Bs
68°7'E
2933 km
C
Warm Temperate
(Sub tropical)
Tropic of Cancer
Tropical
20°
Arabian Sea
16°
3214 Kilometre
Lakshadweep (India)
12°
Tamil Nadu
As
Andaman & Nicobar Islands (India)
Southernmost Point of Mainland India (Kanyakumari)
Southernmost point of India Indira Point
8°N
Sri Lanka
72°E
76°
84°
88°
92°E

Extremes	**State**	**Point**
Northernmost:	Himachal Pradesh	Indira Col
Southernmost:	Tamil Nadu	Kanyakumari/Cape Camorin/ Indira Point
Easternmost:	Arunachal Pradesh	Kibithu
Westernmost:	Gujarat	Guhar Moti/Sir Creek


INDIA
ADJACENT COUNTRIES
36°N
32°
28
24°
20°
16°
12°
8°
AFGHANISTAN
PAKISTAN
JAMMU AND KASHMIR
HIMACHAL PRADESH
PUNJAB
UTTARAKHAND
HARYANA
DELHI
CHINA (TIBET)
NEPAL
RAJASTHAN
UTTAR PRADESH
BIHAR
ASSAM
BANGLADESH
Tropic of Cancer
GUJARAT
MADHYA PRADESH
JHARKHAND
WEST BENGAL
MYANMAR
ODISHA
MAHARASHTRA
CHHATTISGARH
ANDHRA PRADESH
ARABIAN SEA
BAY OF BENGAL
International Boundary
State Boundary
TAMIL NADU
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)

$23\frac{1}{2}^\circ N$

Indira Point

- $15^\circ = 1$ hr
- $7.5^\circ = 30$ mins
- Total time: 24 hrs
- Indian Standard Time (IST): 82.5° E
- IST passes through: 5 states

↓

M: Madhya Pradesh
O: Odisha
U: Uttar Pradesh (Naini, Mirzapur)
C: Chattisgarh
A: Andhra Pradesh

- India's important latitude: Tropic of Cancer → $23\frac{1}{2}^\circ N$

↓

Pass through 8 states

TRICK

↓

Gujarati	Raja	Made	Chief	Justice	Win	The	Meeting
↓	↓	↓	↓	↓	↓	↓	↓
Gujarat	Rajasthan	Madhya Pradesh	Chattisgarh	Jharkhand	West Bengal	Tripura	Mizoram

- How many capital cities of these 8 States are above (in North) Tropic of Cancer?

→3 states

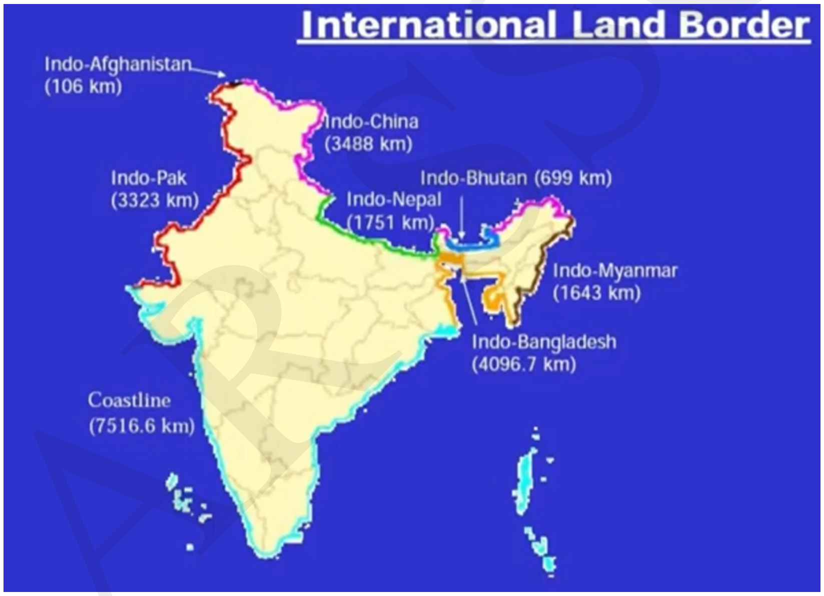
Rajasthan	Mizoram	Tripura
Jaipur	Aizawl	Agartala

- Tropic of Cancer meets IST at: Korea, Chattisgarh (Baikunthpur)

- Countries that share boundary with India:

B: Bangladesh → 4,096.7 km (longest)
C: China → 3,488 km
P: Pakistan → 3,323 km
N: Nepal → 1,751 km
M: Myanmar → 1,643 km
B: Bhutan → 699 km
A: Afghanistan → 106 km (least)

total: 15,106.7 km


International Land Border
Indo-Afghanistan (106 km)
Indo-China (3488 km)
Indo-Pak (3323 km)
Indo-Bhutan (699 km)
Indo-Nepal (1751 km)
Indo-Myanmar (1643 km)
Indo-Bangladesh (4096.7 km)
Coastline (7516.6 km)

Bangladesh: India and Bangladesh → Radcliffe Line

M	A	M	Take	Water
↓	↓	↓	↓	↓
Meghalaya	Assam	Mizoram	Tripura	West Bengal

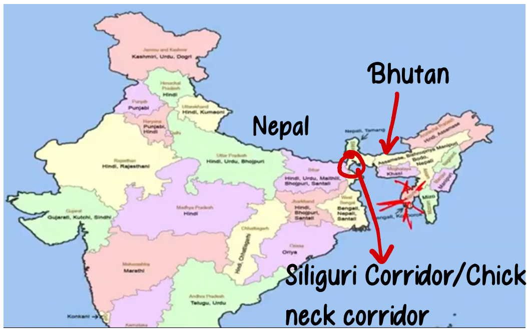
↓ It is surrounded by Bangladesh from three sides

Train b/w Bangladesh to India

- Bandhan Express
- Mitali Express

Nepal

S	U	B	B	U
↓	↓	↓	↓	↓
Sikkim	Uttar Pradesh	Bihar	West Bengal	Uttarakhand


Bhutan
Nepal
Siliguri Corridor/Chicken-neck corridor

Bhutan

B → West Bengal

A → Assam

S → Sikkim

A → Arunachal Pradesh

Pakistan: Pakistan and India → Line of Control (LOC) → Agreed

+ Radcliffe Line

G → Gujarat

R → Rajasthan

P → Punjab

J & K

Ladakh

Train b/w India and Pakistan:

- Samjhauta Express
- Thar Express

Train to Pakistan (book):

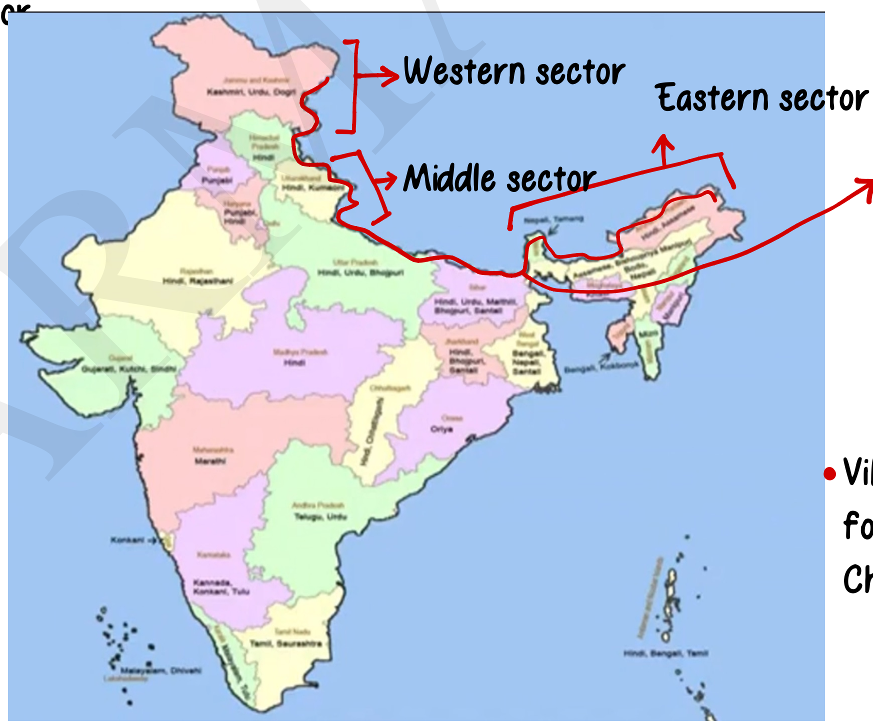
Khushwant Singh

China

Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh

- **India-China Border divided into 3 sectors:**

1. Western sector
2. Middle sector
3. Eastern sector



India-China Border divided into 3 sectors

- Vibrant Village Programme for development: India-China border

- Line b/w India and China: Line of Actual Control Control (LAC)

Not agreed

McMohan Line

Johnson Line

- Border Road Organisation (BRO) → 1960

- Border Area Development Programme: 7th Five Year Plan
  ↓
  1985-90

- Nepal and Bhutan: SSB (under Ministry of Home Affairs)
- Pakistan and Bangladesh: BSF
- India and China: ITBP (under Ministry of Home Affairs)
- Naxalite affected areas: Red Corridor

- **Airforce/Navy/Army**: Ministry of Defence
- **Assam Riffles**: Under Home Affairs but operation control under Ministry of Defence
- **CRPF**: Largest force of India

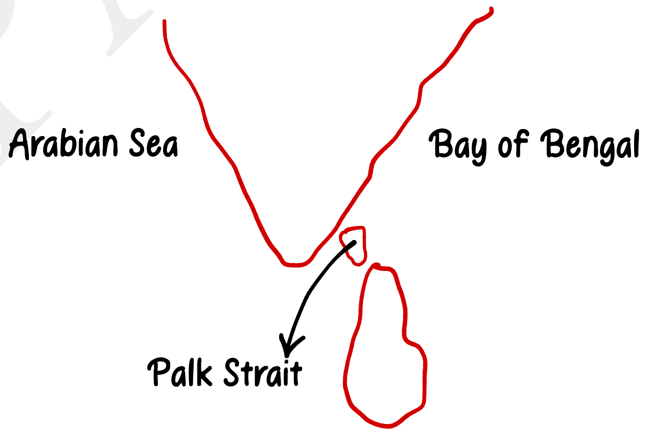
Myanmar

Aru → Arunachal
Na → Nagaland
Ma → Manipur
Mi → Mizoram

Afghanistan
Ladakh

Sri Lanka and India separated by Palk Strait
↓
a narrow passage of water connecting two seas or two other large areas of water

- **Largest Gulf in the world**: Gulf of Mexico
- **Largest Bay in the world**: Bay of Bengal



- State sharing boundary with maximum no. of state: Uttar Pradesh

  8 states + 1 UT (Delhi)

- State sharing boundary with least no. of states: Sikkim, Meghalaya

  West Bengal   Assam

- States sharing boundary with 3 countries:
  1. Sikkim (Nepal, Bhutan, China)
  2. Arunachal (Bhutan, China, Myanmar)
  3. West Bengal (Nepal, Bhutan, Bangladesh

- 1 UT that shares boundary with 3 countries: Ladakh (Pakistan, China, Afghanistan)

Coastal Boundary of India

- Total: 7516.6 km
- Mainland: 6100 km
- States: 9

  Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal
- UTs: 4

  Andaman and Nicobar Island, Lakshadweep, Daman and Diu, Puducherry

- longest coastal boundary of the world: Canada
- India is in 13th position

Longest coastline in India: Andaman and Nicobar (1912 km)

State: Gujarat (1214 km)
UT: Andaman and Nicobar (1912 km)

- Shortest coastline: Goa

Territorial Limit of India

- 12 nm = 22 km → To measure coastline
- Contiguous zone = 24 nm
- Exclusive Economic Zone: 200 nm → Nautical miles

- 1 nautical mile = 1.852 km

- India is lying entirely in: Northern Hemisphere

- India can be divided into 6 physiographic regions:
  1. Himalaya
  2. Peninsular Plateau
  3. Northern Plain
  4. Desert
  5. Island
  6. Coastal Plains

- India is 7th largest in the world

- India is bounded by the young fold mountains in the northwest: Himalayas

- Andaman and Nicobar is located on the Eastern Coast of India

- Gulf of Mannar (b/w India and Sri Lanka): Indian Ocean

- Languages of countries
  - Sri Lanka: Sinhala/Tamil
  - Maldives: Dhivehi
  - China: Mandarin
  - Bhutan: Dzongkha

- The place situated on three seas: Kanyakumari

- Sites located on the hills near the Brahmaputra valley on the way to China and Myanmar
  Hading→Jadeite stone is found here

- Line that separates Pakistan and Afghanistan/India and Afghanistan: Durand Line

- Afghanistan capital: Kabul
  Official languages: Pashto and Dari

- Two neighbouring islands of India: Sri Lanka and Maldives

- Water Treaty signed b/w India and Pakistan in year 1960: Indus Water Treaty

- Hill pass located between India and China: Karakoram Pass

- Havelock Island: Andaman and Nicobar Islands

- State capital located 530 meters above the sea level b/w 93 East longitude and 27 North latitude: Itanagar

- City situated along the Coromandel Coast: Tuticorin

- Bordered by Bhutan and Arunachal in the North, Nagaland and Manipur to the East, Meghalaya, Tripura, Mizoram and Bangladesh to the South, West Bengal to the west: Assam

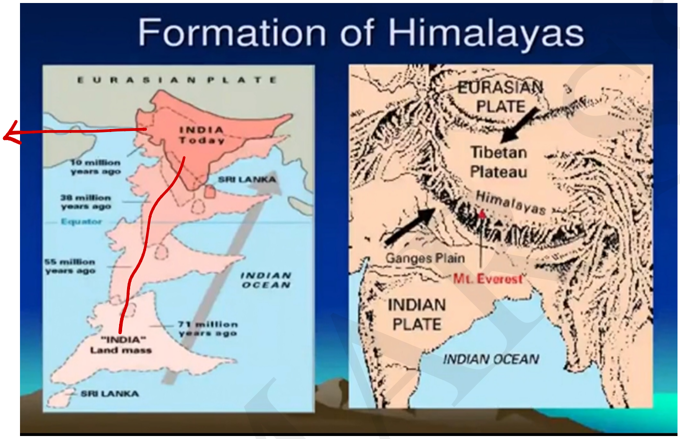
- Total area of the state Goa: 3702 km²

HIMALAYAS

India: 6 Physiographic Divisions

1. The Himalayas
2. Northern Plains
3. Peninsular Plateau
4. The Great Indian Desert
5. Coastal Plains
6. Group of Islands

Tethys


Formation of Himalayas
EURASIAN PLATE
INDIA Today
10 million years ago
SRI LANKA
38 million years ago
Equator
55 million years ago
INDIAN OCEAN
71 million years ago
"INDIA" Land mass
SRI LANKA
EURASIAN PLATE
Tibetan Plateau
Himalayas
Ganges Plain
Mt. Everest
INDIAN PLATE
INDIAN OCEAN

Northern Mountains

Plate convergence

Himalayas

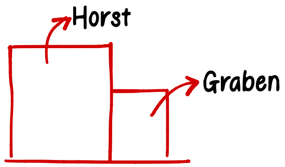
- Young fold mountains (formation: million of years ago)

Eg:

- Andes Mt. Range (South America)
- Alps Mt. Range (Europe)
- Rockies Mt. Range (North America)

- Old fold mountains: formed billion years ago
- Ural Mt. Range (separates Europe and Asia)
- Appalachians (North America)
- Aravalli (India)

Block Mountains


Horst
Graben

Eg:

- Vosges Mountain (France)
- Caucasus Mountains

Volcanic Mountains

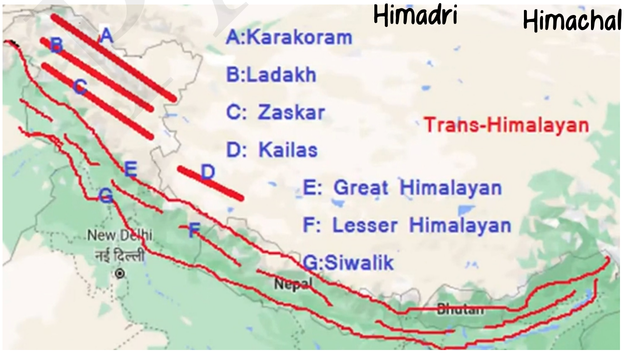
Eg:

- Mount Kilimanjaro (Africa)
- Mount Stromboli (light house of Mediterranean)
- Mount Fujiyama(Japan)
- Mount Ojas del Salado (Chile-Argentina border) → Highest volcanic mountain
- Mount Cotopaxi (Ecuador)

- Himalayas: core is made up of granitic rocks

Trans Himalayas ↓ series of mountains

Himalayan Range
- Great Himalayas ↓ Known as Himadri
- Middle Himalayas ↓ known as Himachal
- Shiwalik ↓ Churiya Hills


A
B
C
D
E
F
G
A:Karakoram
B:Ladakh
C: Zaskar
D: Kailas
E: Great Himalayan
F: Lesser Himalayan
G:Siwalik
Trans-Himalayan
New Delhi
नई दिल्ली
Nepal
Bhutan

Mt. Kailash is a part

- Trans Himalayas: 3 mountain ranges

1. Karakoram Range: highest peak of this range is K2/Godwin Austin (8611 m, world's se highest peak)
2. Ladakh: high slope
3. Zanskar

Shyok river flows b/w Karakoram and Ladakh

Tributary of Indus

Indus flow b/w Ladakh and Zanskar

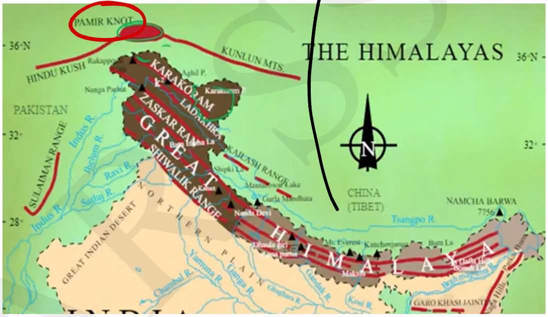
Glaciers of Karakoram Range:

1. Siachen → Operation Meghdoot (1984)
2. Baltoro

Hisper

Diafo

Tibet Plateau: known as Roof of the World


PAMIR KNOT
36°N
HINDU KUSH
Rakaposhi
KUNLUN MTS.
THE HIMALAYAS
36°N
KARAKORAM
K2
Aghil P.
Karakoram P.
Nanga Parbat
LADAKH RA.
ZASKAR RANGE
GREAT
PAKISTAN
SULAIMAN RANGE
Indus R.
Jhelum R.
32°
Bara Lacha La
KAILASH RANGE
N
32°
Ravi R.
Shipki La
SHIWALIK RANGE
Satluj R.
Kamet
Mansarowar Lake
Gurla Mandhata
CHINA
(TIBET)
NAMCHA BARWA
7756
Indus R.
28°
NORTHERN PLAIN
Nanda Devi
Tsangpo R.
GREAT INDIAN DESERT
HIMALAYA
Dhaula giri
Anna purna
Mt Everest
Kanchenjunga
Bum La
Makalu
Dafla Hills
Bomdi La
Brahmaputra R.
Patkai Bum
Naga Hills
Yamuna R.
Ganga R.
Chambal R.
Ghaghara R.
Gandak R.
Kosi R.
GARO KHASI JAINTIA
INDIA

1. Great Himalayas/Himadri/Inner Himalayas

- Western most point: Nanga Parvat
- Eastern most point: Namcha Barwa
- Avg. height: 6000 m

Highest Peaks:

1. Mt. Everest (8848 m, highest in the world)

local names

Sagarmatha (Nepal) Chomolungma (Tibet)

2. Mt. Kanchenjunga (Sikkim): Highest in India (8598 m)
3. Nanda Devi: highest peak in Uttarakhand

(7816 m)

- Mt. Kamet: Uttarakhand

Nepal:

1. Annapurna (8091 m)
2. Dhaulagiri (8167 m)
3. Mount Makalu

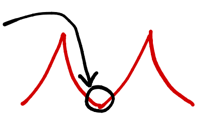
2. Lesser Himalayas/Middle Himalayas/Himachal Himalayas

Avg. Height: 4000 m

Names:

- J & K: Pir Panjal Range
- Himachal Pradesh: Dhauladhar
- Uttarakhand: Nagtibba
- Nepal: Mahabharat Range

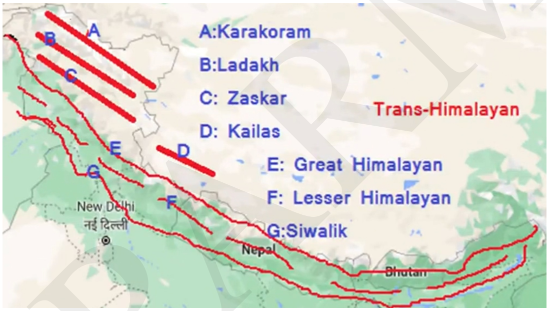
- Valley: घाटी

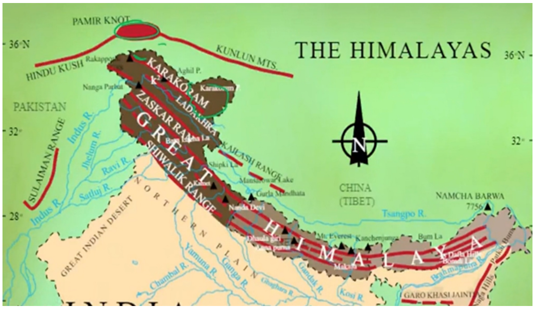


- Kashmir Valley: b/w Great Himalayas and Lesser Himalayas

3. Shiwalik

- Avg. height: 1000 m
  - In the Eastern Himalayas gets replaced by Duars
    ↓
    Good for tea cultivation
- B/w Lesser Himalayas and Shiwaliks: longitudinal valleys known a Duns
- Largest dun: Dehradun


A:Karakoram
B:Ladakh
C: Zaskar
D: Kailas
Trans-Himalayan
E: Great Himalayan
F: Lesser Himalayan
G:Siwalik
New Delhi
नई दिल्ली
Nepal
Bhutan


THE HIMALAYAS
PAMIR KNOT
HINDU KUSH
KUNLUN MTS.
KARAKORAM
LADAKH RA
ZASKAR RA
GREAT HIMALAYA
SHIWALIK RANGE
KAILASH RANGE
SULAIMAN RANGE
PAKISTAN
CHINA (TIBET)
NAMCHA BARWA 7756
Nanga Parbat
K2
Mt. Everest
Kanchenjunga
Nanda Devi
Indus R.
Jhelum R.
Ravi R.
Satluj R.
Tsangpo R.
Yamuna R.
Ganga R.
Chambal R.
Gandak R.
Kosi R.
GREAT INDIAN DESERT
NORTHERN PLAIN
GARO KHASI JAINTIA
36°N
32°
28°

Regional divisions of Himalayas

- Punjab Himalayas: b/w Indus river and Sutlej river
- Kumaon Himalayas: b/w Sutlej and Kali river
- Nepal Himalayas: b/w Kali and Teesta river
- Assam Himalayas: Dihang and Teesta river

Kashmir Himalayas: Karewas formation (glacial deposits)

↓ Zaffron (A local variety of saffron)

Lakes:

- Dal Lake
- Wular Lake

} → fresh water lakes

- Pangong Tso
- Tso Moriri

} → salt water lakes

- Jhelum River: Meanders in its youth stage

↓ Srinagar

Himachal/Uttarakhand Himalayas

- Tribe: Bhotia
- Summer grasslands: Bugyal

Darjeeling and Sikkim Himachal

- Mt. Kanchenjunga
- Tribe: Lepcha/Bhutia tribe
- Absence of Shiwalik → Duars

Arunachal Himalayas

→ jhumming cultivation practiced

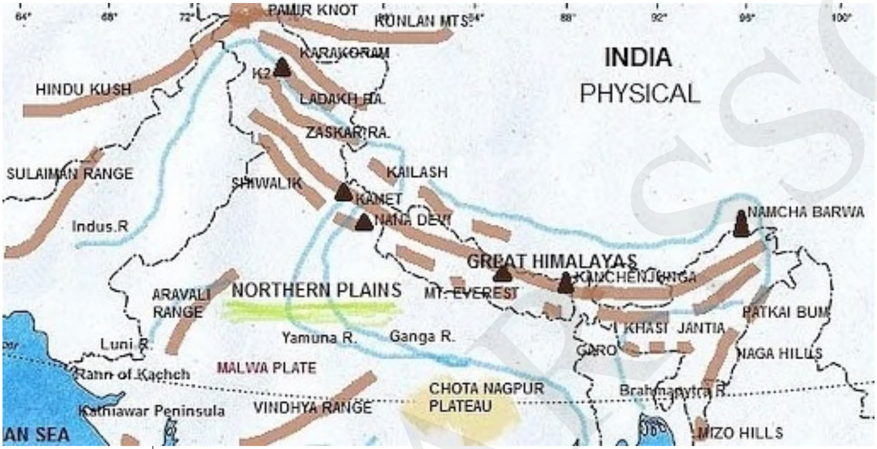
- Important peaks: Kangtu and Namcha Barwa
- Important rivers: Kameng, Subansiri, Dibang
- Tribes:

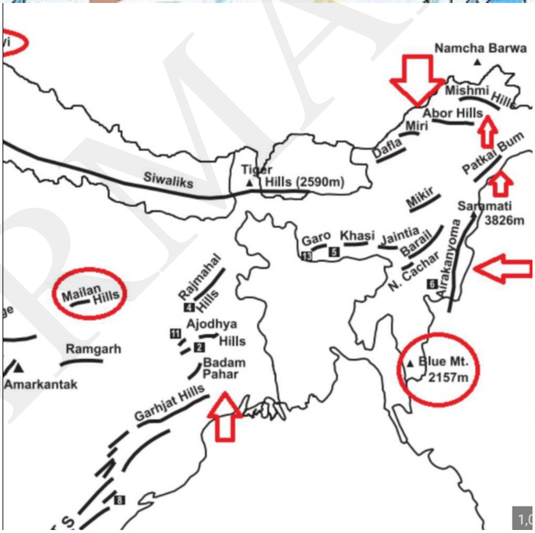
West → East

Monpa Abor Mishimi Nyishi Naga

Eastern/Purvanchal Hills

- Patkai bum
- Naga Hills
- Manipur Hills
- Mizo/Lushai Hills


64°
68°
72°
PAMIR KNOT
KUNLAN MTS
84°
88°
92°
96°
100°
INDIA
PHYSICAL
KARAKORAM
K2
HINDU KUSH
LADAKH RA.
ZASKAR RA.
SULAIMAN RANGE
SHIWALIK
KAILASH
KAMET
NANDA DEVI
NAMCHA BARWA
Indus.R
GREAT HIMALAYAS
KANCHENJUNGA
MT. EVEREST
ARAVALI RANGE
NORTHERN PLAINS
PATKAI BUM
KHASI JANTIA
GARO
NAGA HILLS
Luni R.
Yamuna R.
Ganga R.
Rann of Kachch
MALWA PLATE
CHOTA NAGPUR PLATEAU
Brahmaputra R.
Kathiawar Peninsula
VINDHYA RANGE
AN SEA
MIZO HILLS


Namcha Barwa
Mishmi Hills
Abor Hills
Miri
Dafla
Patkai Bum
Tiger Hills (2590m)
Siwaliks
Mikir
Saramati 3826m
Garo
Khasi
Jaintia
Barail
N. Cachar
Arakanyoma
13
5
6
Mailan Hills
Rajmahal Hills
4
Ajodhya Hills
11
2
Ramgarh
Amarkantak
Badam Pahar
Garhjat Hills
Blue Mt. 2157m
8

- Barak River

↓

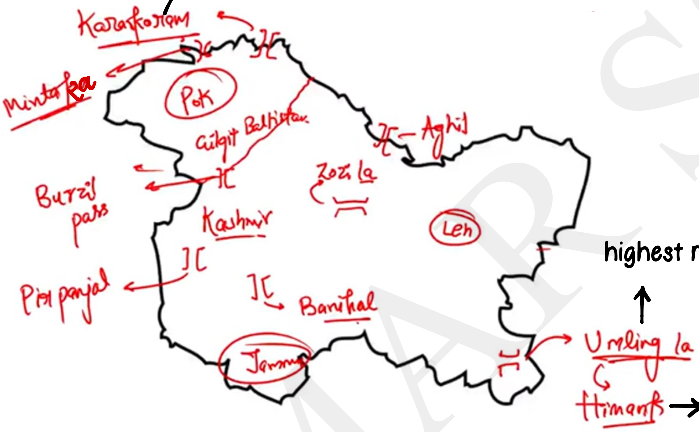
Mizoram: Molasses Basin (soft unconsolidated deposits)

Manipur: Loktak Lake → Keibul Lamjao National Park

- Floating National Park
- State Animal: Shanghai Deer

Passes

Jammu and Kashmir


Karakoram
Mintaka
PoK
Gilgit Baltistan
Aghil
Burzil pass
Zoji la
Kashmir
Leh
Pir panjal
Banihal
Jammu
Umling la
Himank

highest pass

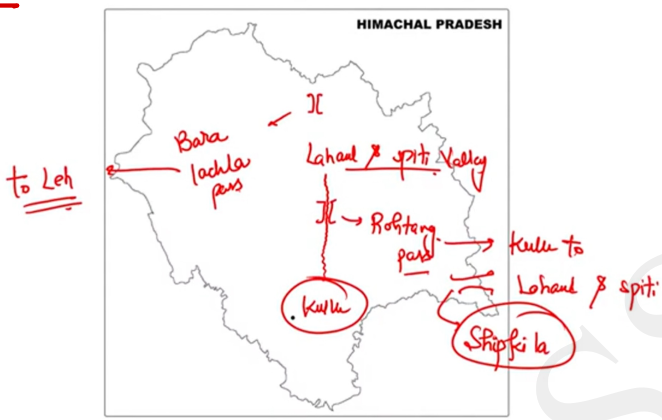
highest motorable road

→ Project

- Jammu to Kashmir/Srinagar: Banihal and Pir Panjal

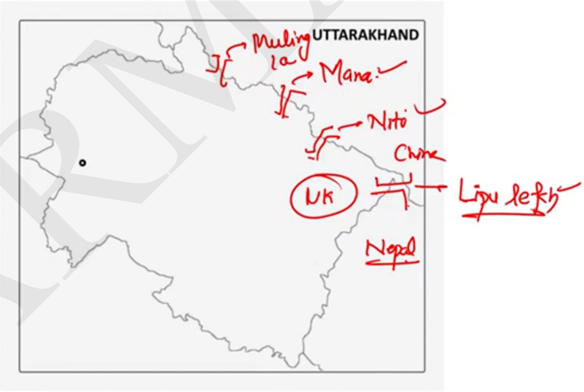
- Kashmir to Gilgit: Burzil
- Kashmir to Leh: Zoji La

Himachal Pradesh


HIMACHAL PRADESH
Bara lachla pass
to Leh
Lahaul & spiti Valley
Rohtang pass
Kullu to Lahaul & spiti
Kullu
Shipki la

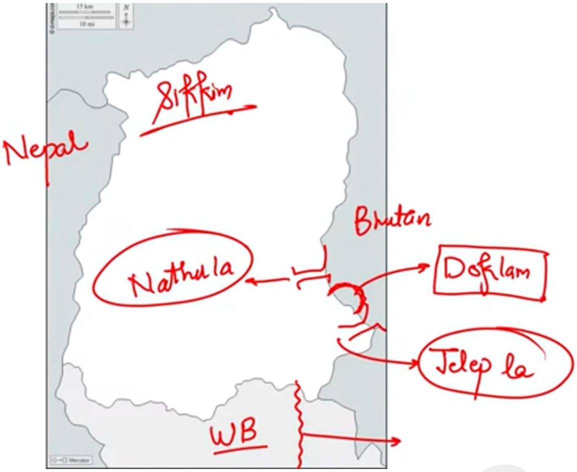
- Rohtang pass connects: Kullu to Lahaul and Spiti Valley
- Baralacha La Pass: Lahaul and Spiti to Leh
- Atal Tunnel in Rohtang Pass

Uttarakhand

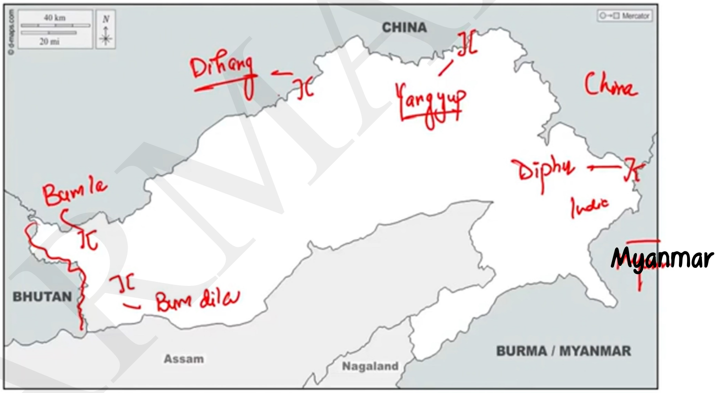

UTTARAKHAND
Muling la
Mana
Niti
China
UK
Lipu lekh
Nepal

- Lipu Lekh located at Trijunction

Sikkim

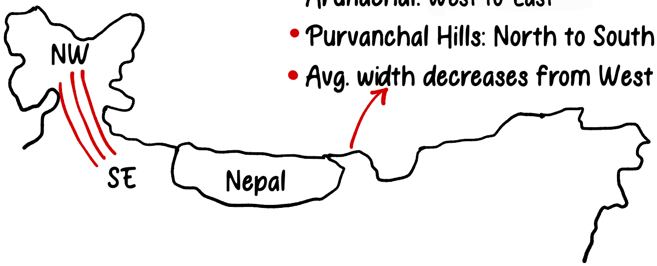

Sikkim
Nepal
Bhutan
Nathula
Doklam
Jelep la
WB

Arunachal Pradesh


40 km
20 mi
N
Mercator
CHINA
Dihang
Yangyup
China
Bum la
Diphu
India
Myanmar
BHUTAN
Bum dila
Assam
Nagaland
BURMA / MYANMAR

General Orientation of Himalayas

- NW Himalayas: NW to SE
- Arunachal: West to East
- Purvanchal Hills: North to South
- Avg. width decreases from West to East



- Appalachians: North America (old mountains
- Aravalli (old)
- Ural (old)

- Harz Mountains (Germany) → Block mountains

- Terai: Belt
  ↓
  Low land region in Northern India and Southern Nepal

- Mount Krakatoa: Indonesia

- Kotli Dun and Patli Dun located b/w: lesser Himalayas and Shiwaliks

- Highest peak in Peninsular India: Anaimudi

- White Mountain: Dhaulagiri (Nepal), covered with white snow

- Deomali, highest peak of: Odisha

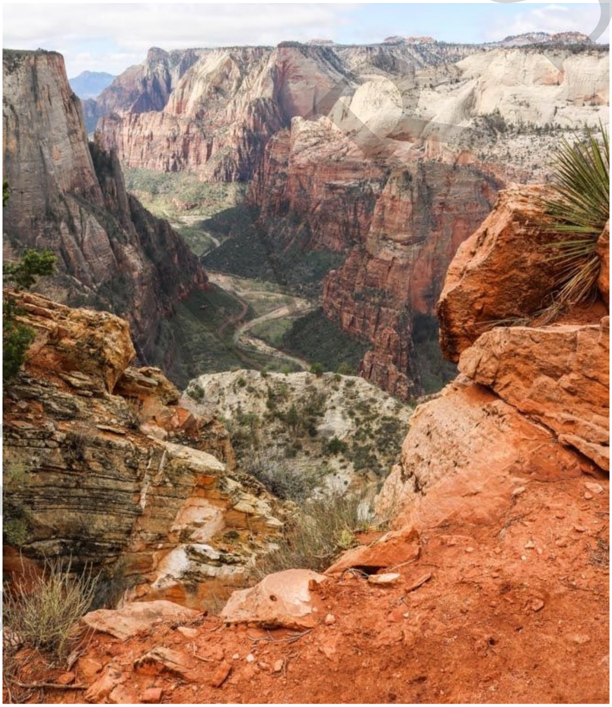
- Mount Tiyi: Nagaland

- Mountain near Dhauliganga: Nanda Devi

- Gorichen peak: Arunachal Pradesh

- Mountain b/w India and Nepal: Kanchenjunga

PENINSULAR PLATEAUS



triangular shaped

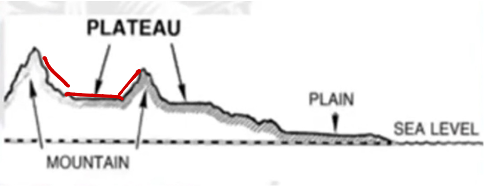
Peninsular Plateaus: Largest physiographic division

What is Peninsular?

- A land mass which is covered by water from three sides

What is a Plateau?

- A plateau is a flat, elevated landform that rises sharply above surrounding area on at least one side


PLATEAU
PLAIN
SEA LEVEL
MOUNTAIN

The Peninsular Plateau

- A table land composed of the old crystalline, igneous, and metamorphic rocks

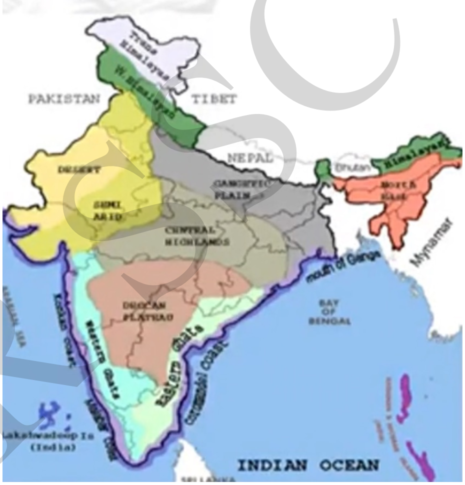
Formation:

- Due to breaking and drifting of Gondwana land
Peninsular Plateau is made up of black soil (volcanic origin)
- It has broad and shallow valleys and rounded hills

Divisions

- Central Highlands
- Deccan Plateau

- Peninsular Plateau general elevation: 600-900 m

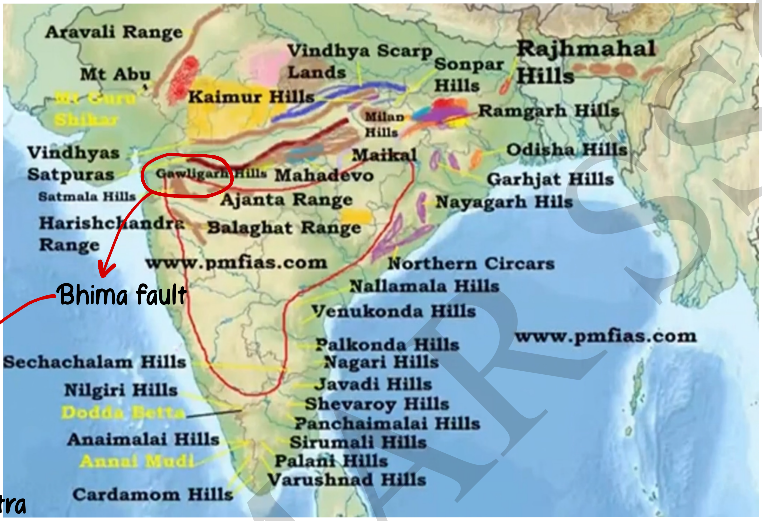

Trans Himalayas
W. Himalayas
PAKISTAN
TIBET
NEPAL
DESERT
SEMI ARID
GANGETIC PLAIN
CENTRAL HIGHLANDS
Bhutan
Himalayas
North East
Myanmar
mouth of Ganga
BAY OF BENGAL
ARABIAN SEA
Konkan coast
Western Ghats
DECCAN PLATEAU
Eastern Ghats
Coromandel coast
Malabar Coast
Lakshwadeep Is (India)
INDIAN OCEAN
SRI LANKA

Satpura

- Block mountains
- 3 hills:
  - Rajpeepla
  - Mahadeo
  - Maikal
- **Highest Peak**: Dhupgarh (Madhya Pradesh) located on Mahadeo Hills
- **Hill station**: Panchmarhi Hills → Queen of Satpura
- Amarkantak Plateau
  - → Makes radial drainage pattern
  - → Rivers that flow: Narmada and Son
  - → abundant deposits of Bauxite

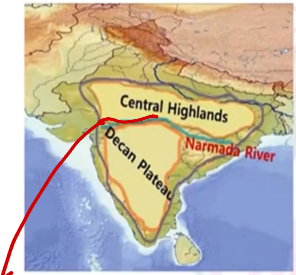
Vindhya

- Panna (Madhya Pradesh) → Famous for diamond
- Highest peak: Sadbhavna Shikhar (Peak of Goodwill)


Aravali Range
Mt Abu
Mt Guru Shikar
Kaimur Hills
Vindhya Scarp Lands
Sonpar Hills
Rajhmahal Hills
Ramgarh Hills
Milan Hills
Maikal
Odisha Hills
Vindhyas
Satpuras
Gawligarh Hills
Mahadevo
Garhjat Hills
Satmala Hills
Ajanta Range
Nayagarh Hils
Harishchandra Range
Balaghat Range
www.pmfias.com
Northern Circars
Nallamala Hills
Venukonda Hills
www.pmfias.com
Palkonda Hills
Nagari Hills
Sechachalam Hills
Javadi Hills
Nilgiri Hills
Shevaroy Hills
Dodda Betta
Panchaimalai Hills
Anaimalai Hills
Sirumali Hills
Annai Mudi
Palani Hills
Varushnad Hills
Cardamom Hills

Bhima fault

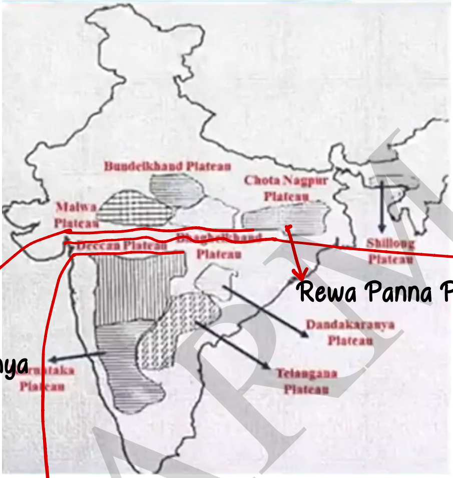
Maharashtra


Central Highlands
Decan Plateau
Narmada River
Rift valley

The Central Highlands
Thar Desert
Aravalli
Vindhyas
Chota Nagpur

Central Highlands

- Part lying to the North of Narmada River
- Covered by Vindhya, bounded by Satpura at South and Aravalis on the Northwest


Bundelkhand Plateau
Chota Nagpur Plateau
Malwa Plateau
Deccan Plateau
Baghelkhand Plateau
Shillong Plateau
Dandakaranya Plateau
Telangana Plateau
Karnataka Plateau
Narmada river
Rewa Panna Plateau
Vindhya
Satpura

Main plateaus

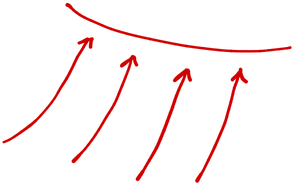
- Malwa Plateau (largest) – Western side
- Chota Nagpur Plateau – Eastern side

- Central Highlands are wider in West but narrower in the East
- (Bundelkhand and Baghelkhand)

- Topmost producer of Cotton: Maharashtra/Gujarat

Malwa Plateau

- In Gujarat, Rajasthan, and Madhya Pradesh
- Made of lava (Basaltic rock) → Black soil originates
- Rivers that flow: Chambal, Betwa, Sindh, Ken → Tributaries of Yamuna
  - From Southwest to Northeast



Aravalis: North West extension of Central Highlands

- Spread across 860 km
- Old fold mountains
- They are residual mountains
- Spread across: Gujarat, Rajasthan, Delhi, Haryana

Raisina Hills

- Highest peak: Guru Shikhar (1722 m)

situated in Mt. Abu Hills

Temple located: Dilawara Jain Temple

Chota Nagpur Plateau

- Spread across Jharkhand, Chattisgarh, Odisha, West Bengal
- Also known as Ruhr State (famous for minerals)
- 3 important plateaus:
  - Ranchi Plateau
  - Hazaribagh Plateau
  - Koderma Plateau
- Highest peak: Parsavnath (also, name of 23rd Tirthankar)
- River that flows in rift valley: Damodar River (eastern side)
- Jadugada Mines: famous for Uranium

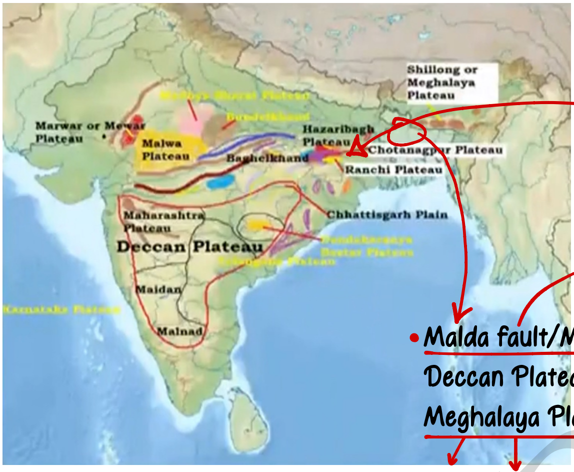
Deccan Plateau

- It is a triangular landmass lying South of river Narmada

Borders

- Satpura: Northern borders
- Mahadev, Kaimur hills, and Maikal range: Eastern borders
- Tilted towards East
- The Deccan Plateau is higher in the west and slopes gently eastwards
- An extension of these plateaus is found in North East
- Meghalaya plateau (Garo, Khasi and Jaintia Hills), Karbi Anglong plateau and North Cachar hills

Assam


Shillong or Meghalaya Plateau
Madhya Bharat Plateau
Bundelkhand
Marwar or Mewar Plateau
Malwa Plateau
Hazaribagh Plateau
Baghelkhand
Chotanagpur Plateau
Ranchi Plateau
Chhattisgarh Plain
Maharashtra Plateau
Deccan Plateau
Dandakaranya
Bastar Plateau
Telangana Plateau
Maidan
Karnataka Plateau
Malnad

Rajmahal Hills: makes North Eastern boundary of Deccan Plateau

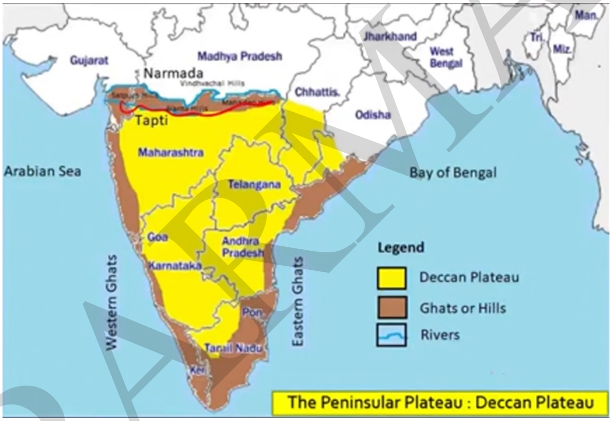
West Bengal

- Malda fault/Malda gap: Separates entire part of Deccan Plateau from Karbi Anglong Plateau/ Meghalaya Plateau/North Cachar Plateau

Garo Khashi Jayantia (Hills)

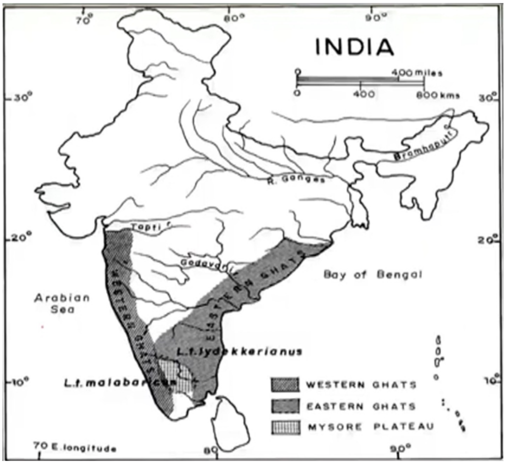
Mikir Hills Rengma Hills

Cherrapunji, Mawsynram (highest rainfall in India), Shillong


Gujarat
Madhya Pradesh
Narmada
Vindhyachal Hills
Satpura
Tapti
Jharkhand
West Bengal
Chhattis.
Odisha
Man.
Tri.
Miz.
Maharashtra
Telangana
Arabian Sea
Bay of Bengal
Goa
Karnataka
Andhra Pradesh
Pon
Tamil Nadu
Ker
Western Ghats
Eastern Ghats
Legend
Deccan Plateau
Ghats or Hills
Rivers
The Peninsular Plateau : Deccan Plateau

Western Ghats and Eastern Ghats

- Both Western Ghats and Eastern Ghats lies west and east of the Deccan Plateau respectively
- Both the ghats have some distinctive features and differentiating points
- These are block mountains

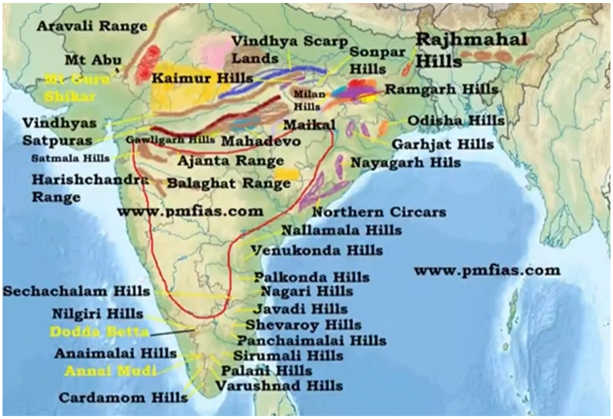

INDIA
400 miles
0
400
800 kms
70°
80°
90°
30°
20°
10°
Bramhaputra
R. Ganges
Tapti
Godavari
WESTERN GHATS
EASTERN GHATS
Arabian Sea
Bay of Bengal
L.t.lydekkerianus
L.t.malabaricus
▨ WESTERN GHATS
▨ EASTERN GHATS
▥ MYSORE PLATEAU
70 E.longitude

Western Ghats

- Continous and can be crossed through passes only
- Higher than eastern: 900-1600 m
- Stretch from Tapi to South of Nilgiri Hills
- Spread across: Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa
- Cause Orographic rainfall
- Height increase from North to South
- Highest peak: Anaimudi (Anaimalai Hills)- 2695 m → Kerala
- 2nd highest peak: Doddabetta (2637 m) → on Nilgiri Hills → Ooty is here (Hill station) → Tamil Nadu
- Southernmost Hills: Cardamom Hills

Eastern Ghats

- Discontinuous, irregular, and Dissected by rivers
- Stretched from Mahanadi Valley to the Nilgiri → Connects Western Ghats to Eastern Ghats
- Highest peak: Mahendragiri (1501 m)/ Jindhagada (1690 m)
- Shevaroy Hills and Javadi Hills are located to the southeast to it


Aravali Range
Mt Abu
Mt Guru Shikar
Vindhya Scarp Lands
Kaimur Hills
Sonpar Hills
Rajhmahal Hills
Ramgarh Hills
Milan Hills
Maikal
Odisha Hills
Vindhyas
Satpuras
Gawligarh Hills
Mahadevo
Garhjat Hills
Satmala Hills
Ajanta Range
Nayagarh Hils
Harishchandra Range
Balaghat Range
www.pmfias.com
Northern Circars
Nallamala Hills
Venukonda Hills
Palkonda Hills
Nagari Hills
www.pmfias.com
Sechachalam Hills
Nilgiri Hills
Dodda Betta
Javadi Hills
Shevaroy Hills
Panchaimalai Hills
Anaimalai Hills
Sirumali Hills
Annai Mudi
Palani Hills
Varushnad Hills
Cardamom Hills

Passes

- **Bhorghat**: Mumbai to Pune
- **Thalghat:** Mumbai to Nasik
- **Pal Ghat:** Annamalai to Nilgiri

- Mountain Peak at the mountainous border of Indian state of Nagaland and the Sagaing region of Myanmar: Mount Saramati

- Mountains in the northwest, north, and northeast bind India: Young fold mountains

- **Mount Jopuno:** Sikkim

- Kumaon Himalayas is between Sutlej and Kali

- Oldest mountain/hills range in India: Aravali Hills

- **Lipu Lekh pass:** Uttarakhand

↓

Located at tri-junction
India, Nepal, and China

- Mountain that looks like a giant pyramid and has a flat summit area and two peaks: Kamet

- Core of Great Himalayas is composed of: Granite (igneous rock)

↓

continental crust

- **Oceanic Crust**: made of Basaltic rock, is denser and is thin

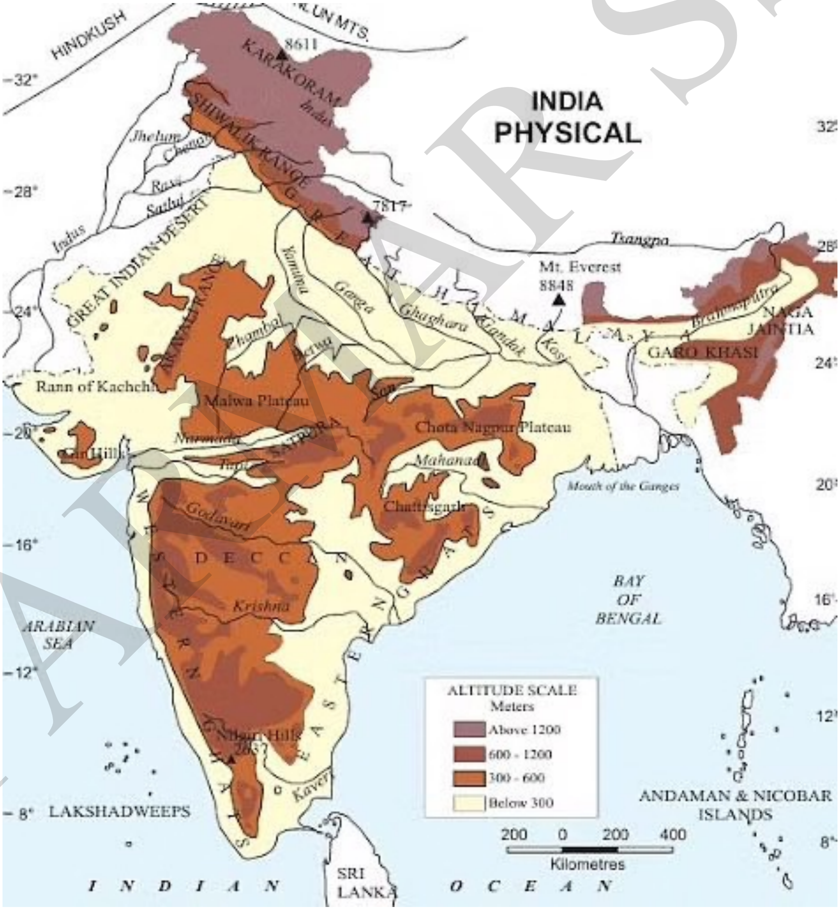
- Rohtang pass cuts through Pir Panjal range and links Manali and Leh by road

- Ladakh range extends from northern side of Leh to the Tibetan Border and comprises Digar La Pass and Khardung La Pass

- K2 mountain is situated near Siachen region of Ladakh in India
- Jawahar Tunnel: Banihal Pass (J&K and Srinagar)
- Land route to Kailash and Mansarovar passes through: Mana Pass
- Javadi: Eastern Ghats peak
- Nilachal Hills: Guwahati

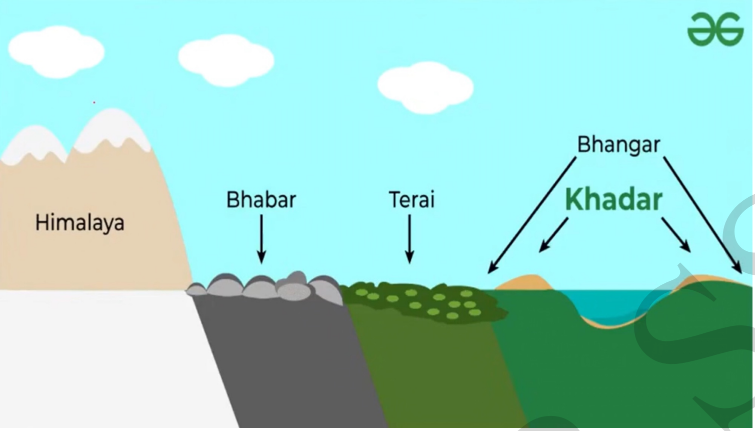
  Kamakhya Temple is situated here
- Fotu La (4108 m) is highest point of Ladakh under Zanskar mountain range
- Highest hill station: Leh
- Hills in Andhra Pradesh: Nagari Hills
- Borra Caves in Andhra Pradesh is situated on the East Coast of India in: Ananthagiri Hills
- Patkai bum: Eastern part of India
- Shatrunjaya Hills located in Gujarat
- Maikal is a range not a plateau
- Deccan Plateau spread across: Telangana, Maharashtra, Karnataka, Kerala, Andhra Pradesh , Madhya Pradesh, Chattisgarh, Tamil Nadu

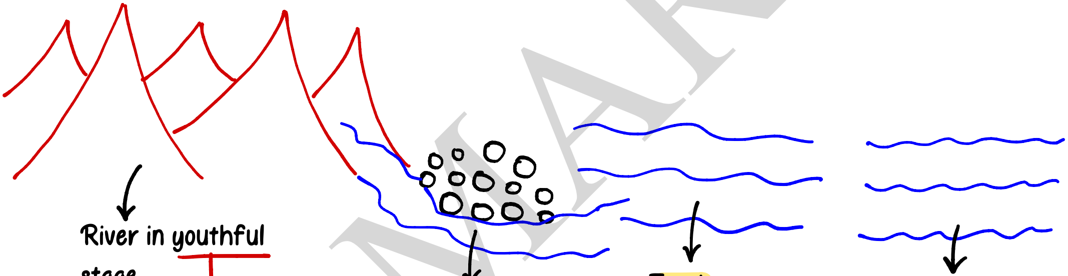
NORTHERN PLAINS AND ISLANDS



HINDKUSH
KUN MTS.
8611
KARAKORAM
Indus
INDIA PHYSICAL
Jhelum
Chenab
Ravi
Satluj
Indus
SHIWALIK RANGE
GREAT HIMALAYA
7817
Tsangpo
GREAT INDIAN DESERT
Yamuna
Ganga
Mt. Everest 8848
Ghaghara
Gandak
Kosi
Brahmaputra
NAGA JAINTIA
GARO KHASI
ARAVALI RANGE
Chambal
Betwa
Rann of Kachchh
Malwa Plateau
Son
Chota Nagpur Plateau
Gir Hills
Narmada
SATPURA
Tapi
Mahanadi
Mouth of the Ganges
Chhattisgarh
Godavari
DECCAN
WESTERN GHATS
EASTERN GHATS
Krishna
BAY OF BENGAL
ARABIAN SEA
Nilgiri Hills 2637
Kaveri
LAKSHADWEEPS
ANDAMAN & NICOBAR ISLANDS
SRI LANKA
INDIAN OCEAN
ALTITUDE SCALE
Meters
Above 1200
600 - 1200
300 - 600
Below 300
200 0 200 400
Kilometres
32°
28°
24°
20°
16°
12°
8°

Northern Indian Plains





River in youthful stage → performs erosion

Bhabar
→ streams of river disappear
→ big stone pebbles seen here

Terai
→ streams of river will reappear
- without properly demarcated channel
- marshy area
- lush green vegetarian seen here

Alluvial flood plain

Khadar
- New deposition
- Better fertility than bhangar
- renews every year

Bhangar
- Old deposition
- More calcareous concentration → Kankad

Coasts of India

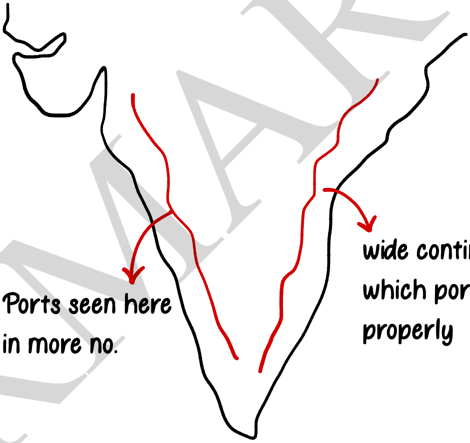
- 9 coastal states + 4 UTs

Western Coastal Plains

- Narrow in middle and wider in the ends
- Submerging
- Rivers do not form delta
- Formation of Kayals (Backwaters) → Punnamada Kayal: Nehru Trophy (Boat race)
- Port development is easy

Eastern Coastal Plains

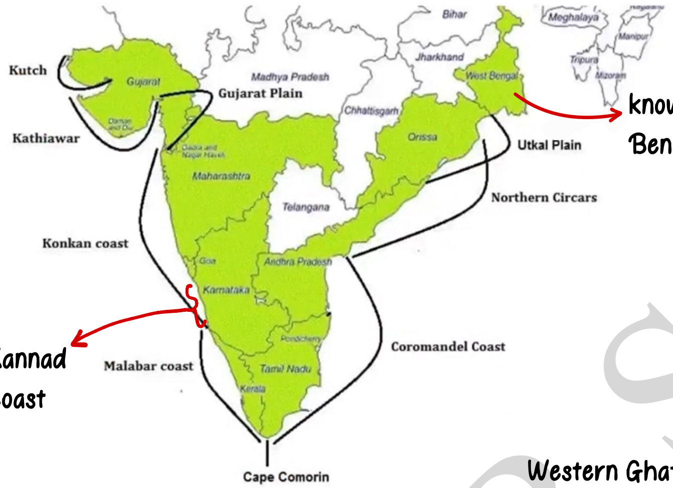
- Wider
- Emerging
- Form Delta



Ports seen here in more no.

wide continental shelf, due to which ports are not developed properly

- World's largest continental shelf: Siberian Shelf → In Arctic Ocean


Kutch
Kathiawar
Gujarat Plain
Konkan coast
Malabar coast
Cape Comorin
Coromandel Coast
Northern Circars
Utkal Plain
Gujarat
Daman and Diu
Dadra and Nagar Haveli
Madhya Pradesh
Maharashtra
Chhattisgarh
Bihar
Jharkhand
West Bengal
Orissa
Telangana
Andhra Pradesh
Goa
Karnataka
Pondicherry
Tamil Nadu
Kerala
Meghalaya
Manipur
Tripura
Mizoram

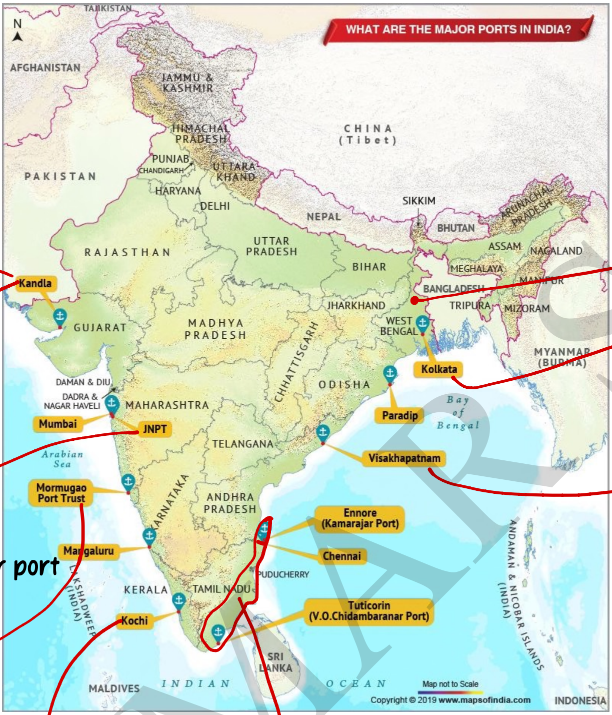
known as Baiga Plain in Bengal

Kannad Coast

Western Ghats is known as Sahyadri in Maharashtra

Ports of India

- Major
  - 13 ports
    - 12
      - Govt. Owned
        - Ownership and management by Central Govt.
    - 1
      - Pvt.
        - Ennore (Kamrajkar Port)
- Minor
  - 200
    - Owned by State Govt.


WHAT ARE THE MAJOR PORTS IN INDIA?
N
TAJIKISTAN
AFGHANISTAN
JAMMU & KASHMIR
HIMACHAL PRADESH
CHINA (Tibet)
PUNJAB
CHANDIGARH
UTTARAKHAND
PAKISTAN
HARYANA
DELHI
SIKKIM
ARUNACHAL PRADESH
NEPAL
BHUTAN
RAJASTHAN
UTTAR PRADESH
ASSAM
NAGALAND
BIHAR
MEGHALAYA
MANIPUR
BANGLADESH
Kandla
JHARKHAND
TRIPURA
MIZORAM
GUJARAT
MADHYA PRADESH
WEST BENGAL
MYANMAR (BURMA)
CHHATTISGARH
Kolkata
DAMAN & DIU
ODISHA
DADRA & NAGAR HAVELI
MAHARASHTRA
Paradip
Bay of Bengal
Mumbai
JNPT
Arabian Sea
TELANGANA
Visakhapatnam
Mormugao Port Trust
ANDHRA PRADESH
KARNATAKA
Ennore (Kamarajar Port)
Mangaluru
Chennai
PUDUCHERRY
KERALA
TAMIL NADU
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
Tuticorin (V.O.Chidambaranar Port)
Kochi
SRI LANKA
MALDIVES
INDIAN OCEAN
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INDONESIA

Tidal port

Also known as Deendayal Port Trust

- Also, Nhava Sheva Port
- Largest container port

In Zuary river's estuary

Queen of Arabian Sea

Only state to have max. major ports

oldest port developed by British in 1870s

Haldia Port (West Bengal)

- Riverine port
- Also known as Shyama Prasad Mookerjee Port

India's deepest landlocked port

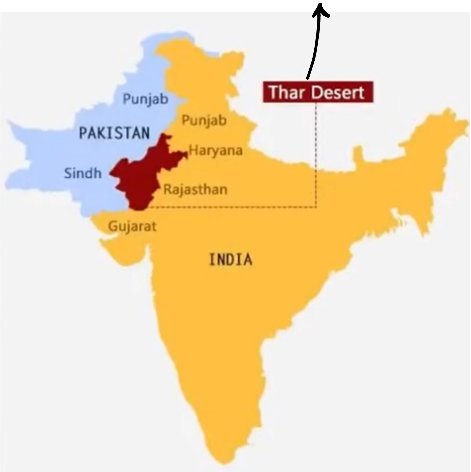
Great Indian Dessert

- Seen in North Western of Aravali
- Low rainfall: < 150 mm/year
- Also known as Marusthali
- Most rivers are ephemeral

Features:

- Barchans, Seif
- Mushroom rocks
- Pedestrial rocks
- Oasis is seen here → green part in desert

Rajasthan


Thar Desert
Punjab
PAKISTAN
Punjab
Haryana
Sindh
Rajasthan
Gujarat
INDIA

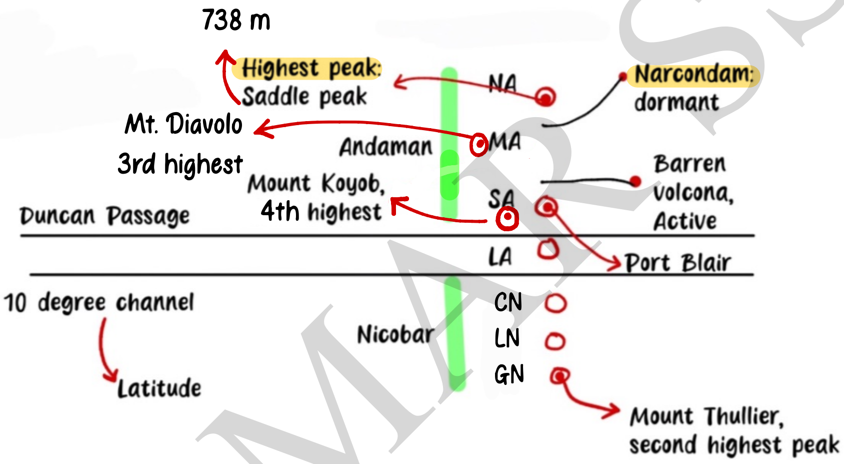
made of coral deposits

Islands: Part of land surrounded by water from all four sides

Arabian Sea
- Lakshadweep
- **Total**: 36 islands
- **Largest**: Andrott

Bay of Bengal
- Andaman and Nicobar group of islands
- **Total**: 572 islands
- **Largest**: Great Nicobar

extension of Arakan Yoma (in Myanmar)



738 m
Highest peak:
Saddle peak
Mt. Diavolo
3rd highest
Andaman
Mount Koyob,
4th highest
Duncan Passage
NA
MA
SA
LA
Narcondam:
dormant
Barren
Volcona,
Active
Port Blair
10 degree channel
Latitude
Nicobar
CN
LN
GN
Mount Thullier,
second highest peak

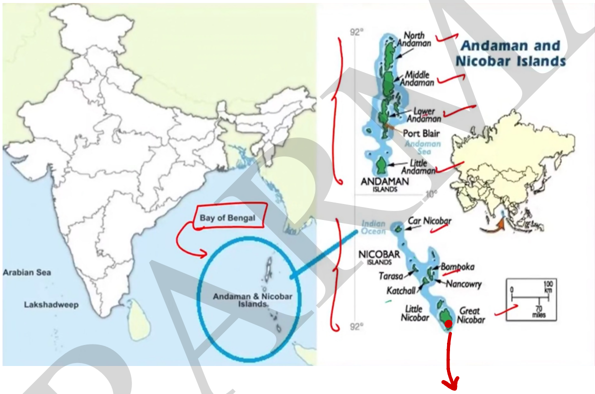
10°channel
- separates Andaman group of Islands and Nicobar group of Islands
- separates Little Andaman and Car Nicobar

Duncan Passage: Separates South Andaman and Little Andaman

Tribes
- Andaman: Negrito group → North Andamanese, Jarawa, Onge, Senthelese
- Nicobar → Shompen, Nicobarese

National Parks in Andaman and Nicobar

Campbell Bay National Park
Galathea National Park
Mahatma Gandhi Marine National Park
Middle Button Island National Park
Mount Harriet National Park
North Button Island National Park
Rani Jhansi Marine National Park
Saddle Peak National Park
South Button National Park

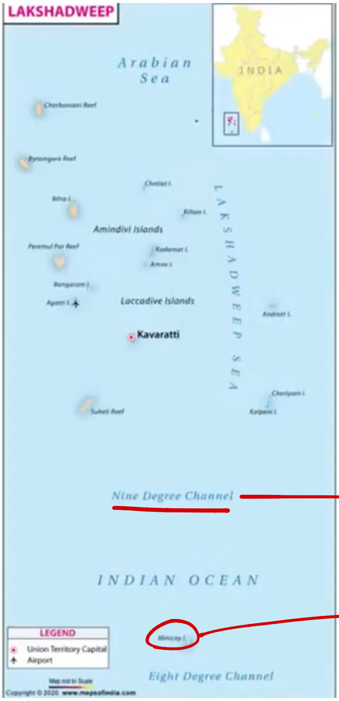

Arabian Sea
Lakshadweep
Bay of Bengal
Andaman & Nicobar Islands.
92°
North Andaman
Andaman and Nicobar Islands
Middle Andaman
Lower Andaman
Port Blair
Andaman Sea
Little Andaman
ANDAMAN ISLANDS
10°
Indian Ocean
Car Nicobar
NICOBAR ISLANDS
Bompoka
Tarasa
Nancowry
Katchall
Little Nicobar
Great Nicobar
0
100 km
70 miles
92°

Pygmalion point

Islands renamed:

- Ross Islands ⟶ Netaji S. C. Bose Island
- Neil Island ⟶ Shaheed Dweep
- Havelock Island ⟶ Swaraj Dweep

- Unnamed islands were renamed on 21 Paramveer Chakra Awardees name


LAKSHADWEEP
Arabian Sea
INDIA
Cherbaniani Reef
Byramgore Reef
Chetlat I.
Bitra I.
Kiltan I.
Amindivi Islands
Perumul Par Reef
Kadamat I.
Amini I.
Bangaram I.
Agatti I.
Laccadive Islands
Kavaratti
LAKSHADWEEP SEA
Androth I.
Cheriyam I.
Suheli Reef
Kalpeni I.
Nine Degree Channel
INDIAN OCEAN
Minicoy I.
Eight Degree Channel
LEGEND
Union Territory Capital
Airport
Map not to Scale
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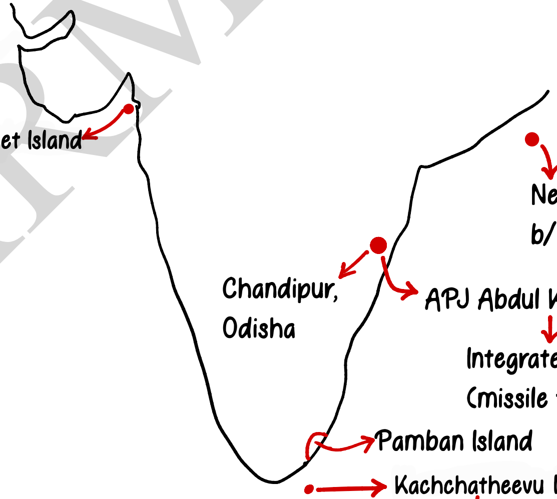
11°channel: separates Aminidivi and Cannanore

8°channel

- Minicoy from Maldives
- Lakshadweep from Maldives

Nine Degree Channel → Entire group of Lakshadweep from Minicoy

→ Minicoy



Sir Creek
Disputed
territory
between India
and Pak

Alia Bet Island

New Moore Island
b/w India and Bangladesh

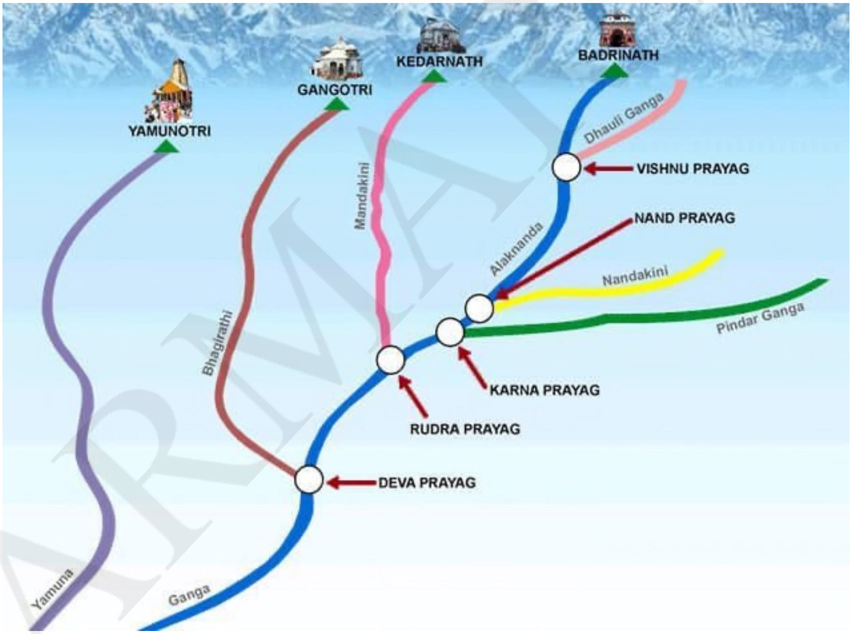
Chandipur,
Odisha

APJ Abdul Kalam Island
↓
Integrated Test Range
(missile testing)

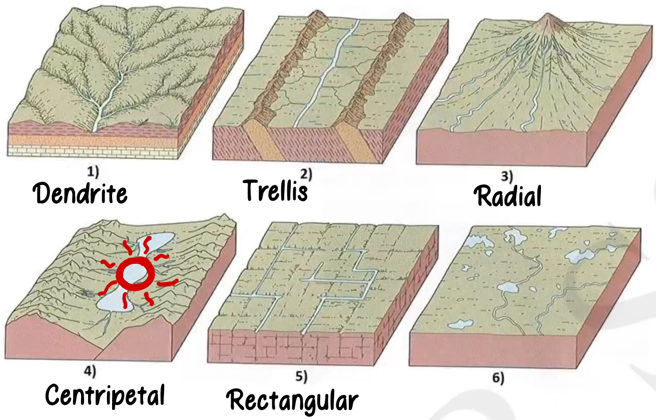
Pamban Island

Kachchatheevu Islands
↓
b/w India and Sri Lanka

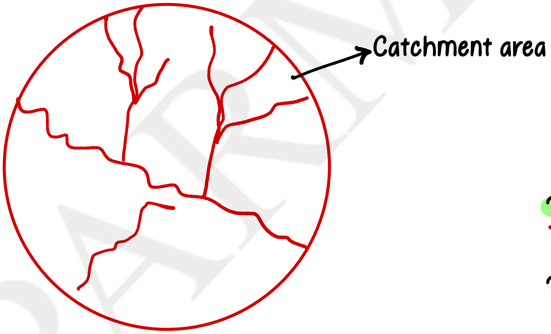
DRAINAGE SYSTEM


YAMUNOTRI
GANGOTRI
KEDARNATH
BADRINATH
Dhauli Ganga
VISHNU PRAYAG
NAND PRAYAG
Mandakini
Alaknanda
Nandakini
Pindar Ganga
Bhagirathi
KARNA PRAYAG
RUDRA PRAYAG
DEVA PRAYAG
Yamuna
Ganga

Different Drainage Patterns


1)
Dendrite
2)
Trellis
3)
Radial
4)
Centripetal
5)
Rectangular
6)

1. **Dendritic**: resemble the branch of a tree
2. **Trellis**: tributaries join the river at right angle
3. **Radial**: rivers originating from a central dome/peak
4. **Centripetal**: rivers draining their water into a central lake/depression


Catchment area

River System

River + Tributaries

↓

Basin/Catchment area

Indian River System

1. Himalayan River System
2. Peninsular River System

- **Origin**: source
- **Mouth**: Drains water

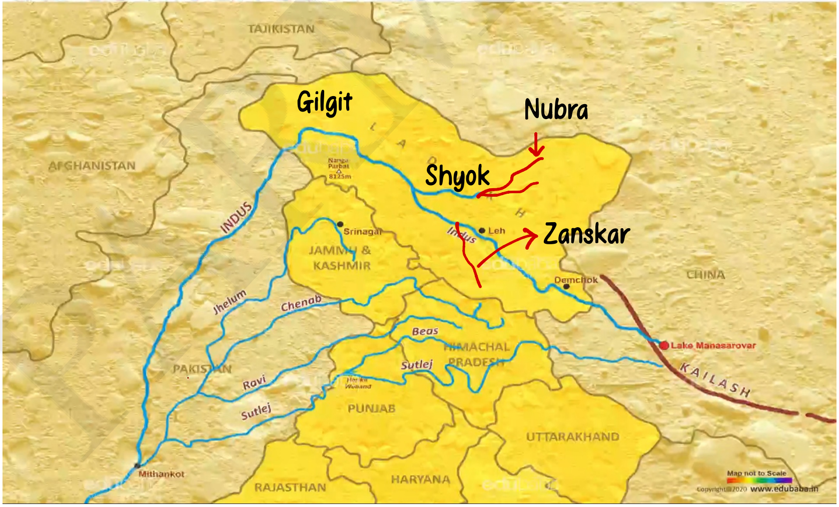
The Himalayan Rivers

1. They are perennial
2. Water throughout the year (Origin/ Source: Glaciers)
3. They have long courses from their source to the sea
4. 3 major rivers: the Indus, Brahmaputra, and Ganga originating from the North of the mountain ranges
5. Ex: the Indus, the Brahmaputra, the Ganga
6. Some Himalayan rivers are antecedent (following their original course), eg: Satluj, Kosi, Indus

The Peninsular River

1. They are ephemeral
2. During dry season, large rivers have reduced flow of water in their channels
3. They have shorter and shallower course
4. Most of the rivers here originate in the Western Ghats and flow towards Bay of Bengal
5. Ex: Narmada, Tapi, Godavari

INDUS RIVER SYSTEM


TAJIKISTAN
AFGHANISTAN
Gilgit
Nubra
Shyok
Nanga Parbat 8125m
INDUS
Srinagar
JAMMU & KASHMIR
Leh
Indus
Zanskar
Demchok
CHINA
Lake Manasarovar
KAILASH
Jhelum
Chenab
Beas
HIMACHAL PRADESH
Sutlej
Ravi
PAKISTAN
Harike Wetland
PUNJAB
UTTARAKHAND
Mithankot
RAJASTHAN
HARYANA
Map not to Scale
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Tributaries of Indus

↓

Jhelum+Chenab+Beas+Ravi+Sutlej = Panchnad

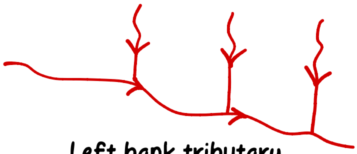
↓

Punjab

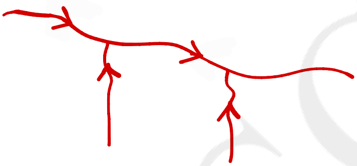
- Panj + Doab → Area between two rivers

Classification of Tributaries

1. Left Bank Tributary
2. Right Bank Tributary



Left bank tributary



Right bank tributary

- **Indus+Jhelum:** Sindh Sagar Doab
- **Jhelum+Chenab:** Jech Doab
- **Chenab+Ravi:** Rechna Doab
- **Ravi+Beas:** Bari Doab
- **Beas+Sutlej:** Bist Doab

Indus

- **Length:** 2880 km/1114 km in India
- **Flows in:** China → India → Pakistan
- National river of Pakistan
- Indus Water Treaty, 1960
  - Signed in Karachi
  - B/w J L Nehru and Ayub Khan
  - **Mediator:** World Bank
  - One of the most successful treaty around the world

Indus
Jhelum
Chenab
} 80% water used by Pakistan
20% water used by India

Ravi
Beas
Sutlej
} 80% water used by India
20% water used by Pakistan

- **Indus origin:** Bokhar Chu Glacier near Lake Mansarovar
- **Drains:** into Arabian Sea
- **Demchok:** enters into India
- **Leh:** located on the banks of Indus River
- Indus in Tibet is known as **Singi Khamban** (Lion's mouth)

Tributaries of Indus

1. **Jhelum**: meanders in its youthful stage

- **Ancient name**: Vitasta
- **Origin**: Verinag (J & K)
- Flows in the border of India and Pakistan
- Srinagar is located on banks of Jhelum
- Wular Lake gets its water from Jhelum

2. **Chenab** → Chandra
→ Bhaga

- **Ancient name**: Askini
- **Origin**: Baralacha La pass
- Largest tributary of Indus

3. **Ravi**

- **Ancient name:** Purushni
- **Origin**: Rohtang pass

4. **Beas**

- **Ancient name**: Bipasha
- **Origin**: Rohtang pass
- Only tributary of Indus that does not pass or enter Pakistan

5. **Sutlej**

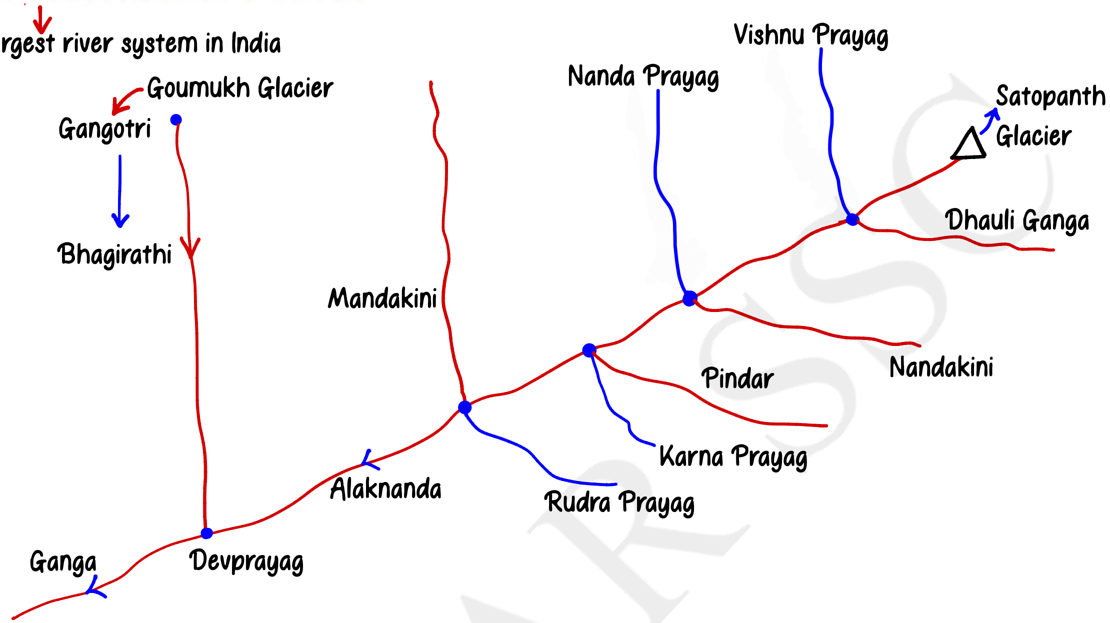
- **Ancient name:** Shutudri
- **Origin**: Rakas lake (Lake Mansarovar)
- It enters India through Shipkila pass

- Panchnad meet Indus at Mithankot, Pakistan

- **Right Bank Tributaries:** Shyok, Gilgit, Hunza

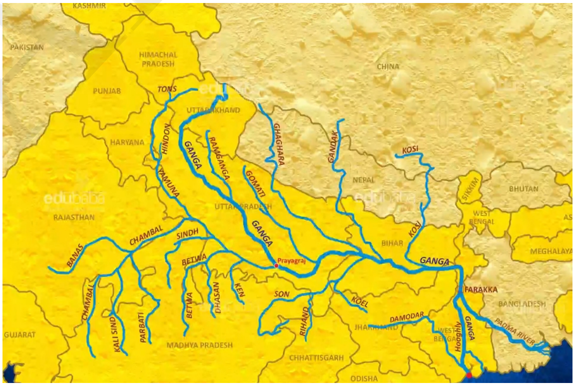
GANGA RIVER SYSTEM

Largest river system in India

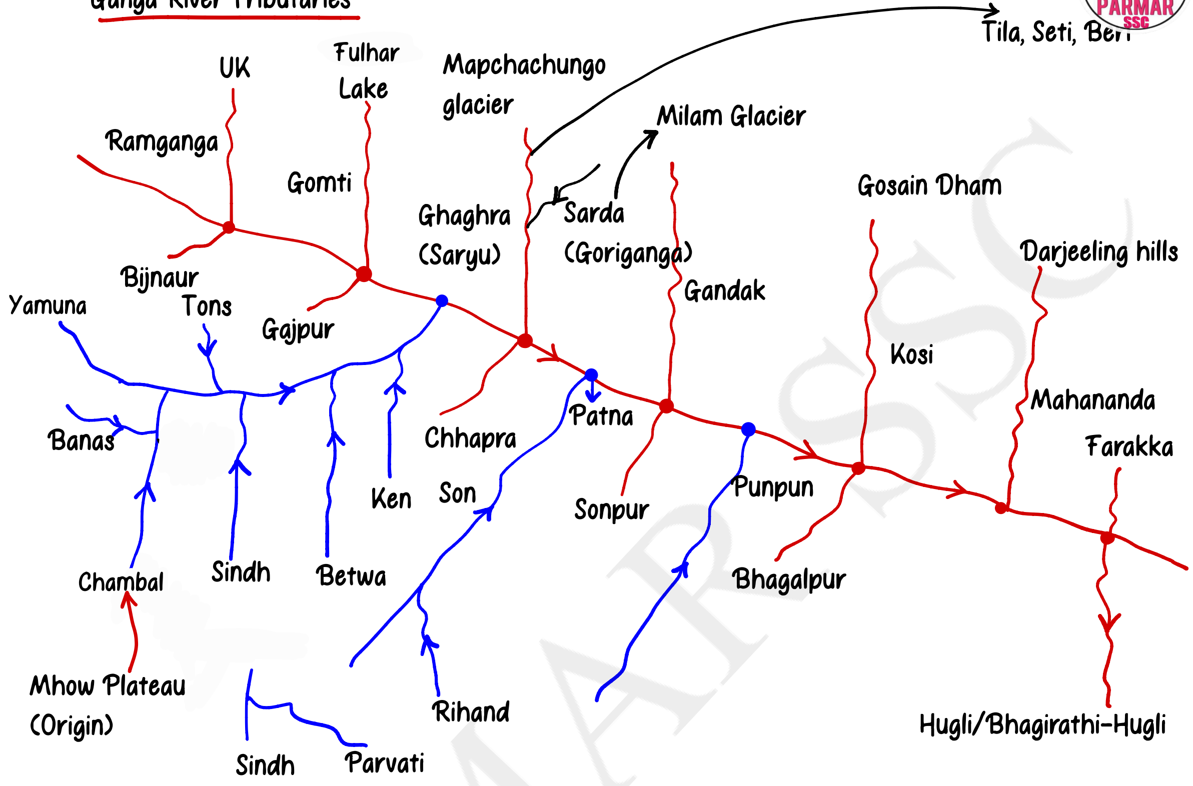

Goumukh Glacier
Gangotri
Bhagirathi
Vishnu Prayag
Nanda Prayag
Satopanth Glacier
Dhauli Ganga
Mandakini
Pindar
Nandakini
Karna Prayag
Rudra Prayag
Alaknanda
Ganga
Devprayag

- **Prayag:** Confluence of two rivers

Alaknanda → Bhagirathi → Dev Prayag
Alaknanda → Dhauliganga → Vishnu Prayag
Alaknanda → Nandakini → Nanda Prayag
Alaknanda → Pindar → Karna Prayag
Alaknanda → Mandakini → Rudra Prayag


KASHMIR
PAKISTAN
HIMACHAL PRADESH
PUNJAB
TONS
CHINA
UTTARAKHAND
HARYANA
HINDON
GANGA
RAMGANGA
GHAGHARA
GANDAK
KOSI
NEPAL
YAMUNA
GOMATI
SIKKIM
BHUTAN
RAJASTHAN
UTTAR PRADESH
GANGA
KOSI
WEST BENGAL
BIHAR
MEGHALAYA
CHAMBAL
SINDH
BETWA
Prayagraj
GANGA
BANAS
CHAMBAL
KALI SINDH
PARBATI
BETWA
DHASAN
KEN
SON
KOEL
FARAKKA
BANGLADESH
PADMA RIVER
RIHAND
DAMODAR
JHARKHAND
HOOGHLY
GANGA
GUJARAT
MADHYA PRADESH
CHHATTISGARH
ODISHA

Ganga River Tributaries



Tila, Seti, Beri
UK
Fulhar Lake
Mapchachungo glacier
Milam Glacier
Ramganga
Gomti
Ghaghra (Saryu)
Sarda (Goriganga)
Gosain Dham
Darjeeling hills
Gandak
Bijnaur
Tons
Yamuna
Gajpur
Kosi
Mahananda
Farakka
Chhapra
Patna
Banas
Ken
Son
Sonpur
Punpun
Chambal
Sindh
Betwa
Bhagalpur
Mhow Plateau (Origin)
Rihand
Hugli/Bhagirathi-Hugli
Sindh
Parvati

Yamuna: 1370 km
- It is the longest tributary of Ganga
- **Tributaries:** Chambal, Sindh, Betwa, Ken, Tons

Origin: Mhow Plateau

Tributaries:
- Parbati
- Kalisindh
- Shipra

Badland Topography due to Ravines (gully erosion)

Son
- **Origin:** Amarkantak Plateau (Radial Drainage Pattern)
- **Tributaries:** Koel, Rihand
- **Punpun:** joins Ganga at Fatuha near Patna

- **Ganga** then flows in Bangladesh where it known as Padma
- Water from Ganga stored in bottle remains fresh due to presence Bacteriophage viruses
- **Total length**: 2525 km
- National River of India, declared in 2008
- Longest River of India
- **Passes through 5 states:** Uttarakhand, Uttar Pradesh (longest), Bihar, J&K (shortest), West Bengal

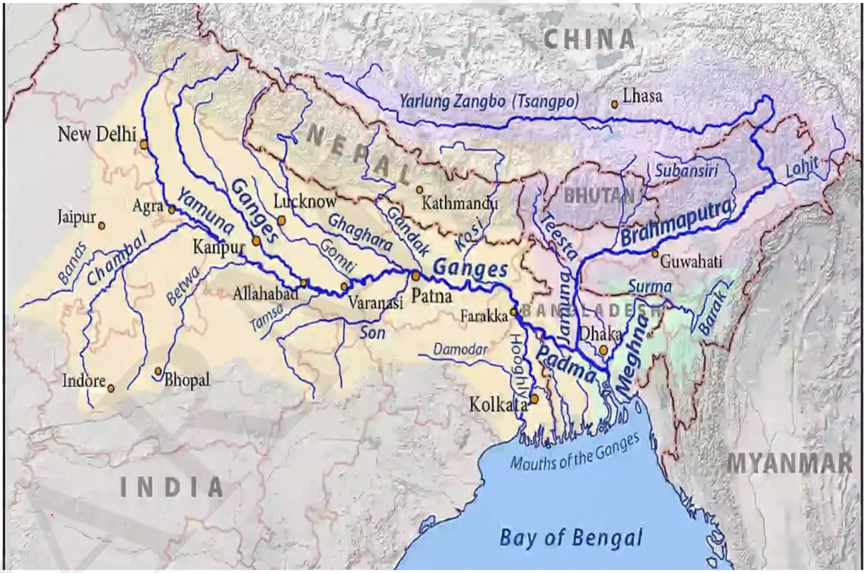
- **Kosi:** Sorrow of Bihar (causes flood in Bihar)

Cities located on banks of Ganga:

- Prayagraj
- Kanpur (largest)
- Varanasi
- Patna

West to East order

BRAHMAPUTRA RIVER SYSTEM


CHINA
Yarlung Zangbo (Tsangpo)
Lhasa
NEPAL
New Delhi
Kathmandu
BHUTAN
Subansiri
Lohit
Brahmaputra
Guwahati
Jaipur
Agra
Yamuna
Ganges
Lucknow
Ghaghara
Gandak
Kosi
Teesta
Kanpur
Banas
Chambal
Betwa
Allahabad
Tamsa
Gomti
Varanasi
Patna
Ganges
Son
Farakka
BANGLADESH
Jamuna
Surma
Barak
Dhaka
Meghna
Damodar
Hooghly
Padma
Indore
Bhopal
Kolkata
Mouths of the Ganges
MYANMAR
INDIA
Bay of Bengal

- **Brahmaputra**: 2900 km
- **Length in India:** 916 km

Different names:

- **Tibet:** Yarlung Tsangpo (origin)
- **Siang and Dihang**: Arunachal Pradesh
- **Assam:** Brahmaputra
- **Jamuna:** Bangladesh

- Takes U-turn in Namcha Barwa
- South turn in Dhubri (Assam)
- **World largest Riverine Island**: Majuli Island
- **Origin:** Chemayungdung Glacier/Angsi Glacier
- Padma + Jamuna = Meghna

Mansarovar Lake

Manipur hills ← Barak

- **World's largest Delta:** Sundarbans Delta (Sundari tree)

Tributaries of Brahmaputra

- **Left Bank Tributaries:** Lohit, Dhansiri
- **Right Bank Tributary:** Dibang, Kameng, Manas, Testa, Subansiri

- Drainage pattern that forms central spire or dome-like structure: Radial Pattern

- Drainage pattern forms when rivers discharge their waters from all directions in lake or depression: Centripetal

- Peninsular drainage system: Mahanadi and Godavari

- When river originates from a hill and flows in all directions, the drainage pattern formed: Radial

- River that marks easternmost boundary of Himalayas: Brahmaputra

- Snow-fed river: Yamuna (origin: Bandarpuch)

- River that is also called Vyath: Jhelum

- The river Indus was also called Hindos by the the Iranians and the Greeks

- The river Ganga divides the state Bihar into two parts

- The region of Ganga lies in: 10°N to 30°N latitude

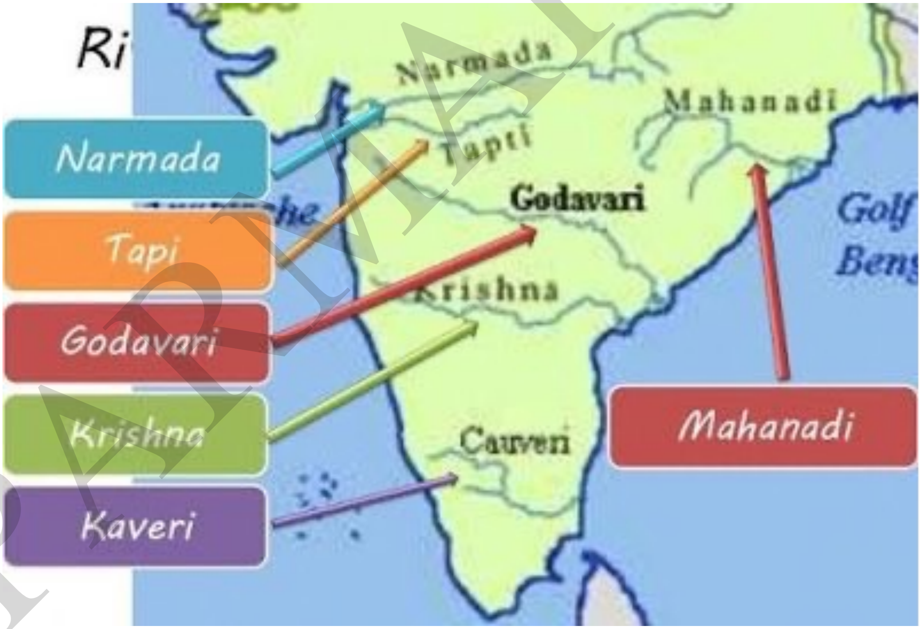
- Yamuna rises in Indian Himalayas

- Source of river Ghaggar: Himachal Pradesh

- The headwater of Ganga: Bhagirathi

- Kolkata is in banks of Hooghly river

PENINSULAR RIVERS



Ri
Narmada
Tapti
Mahanadi
Godavari
Krishna
Cauveri
Golf
Beng
Narmada
Tapi
Godavari
Krishna
Kaveri
Mahanadi

Peninsular Rivers

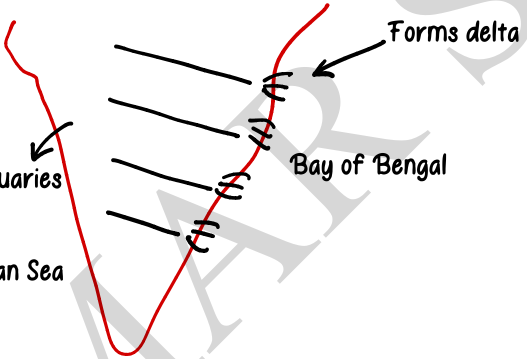
Categories:

1. East flowing rivers
   ↓
   Bay of Bengal (Delta)

   flows in East due to the tilt of Deccan Plateau

   - tilt is towards East
   - East to West

2. West flowing rivers
   ↓
   Arabian Sea/Estuary

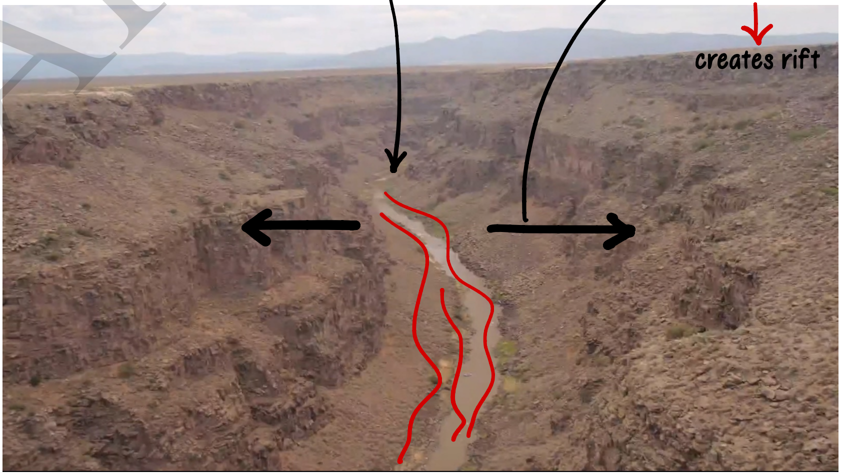

Forms delta
Bay of Bengal
Forms Estuaries
Arabian Sea

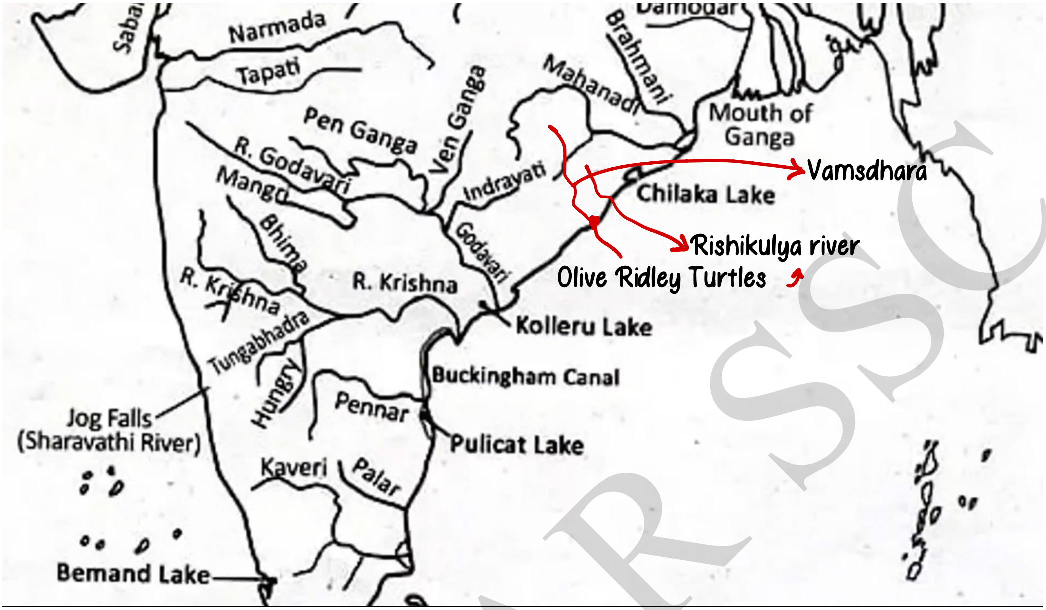
Why?

- Narrow lanes
- Hard rocks, rivers with fresh water directly meets sea water

Rivers flow in rift valley

parts of land separates
↓
creates rift



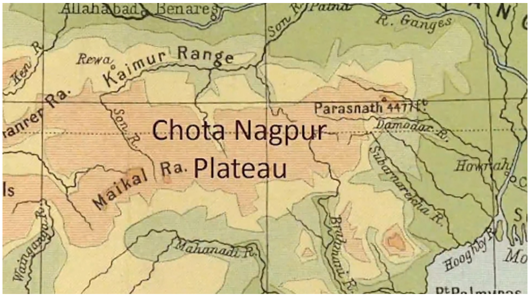

Saba
Narmada
Tapati
Damodar
Brahmani
Mahanadi
Mouth of Ganga
Pen Ganga
Ven Ganga
R. Godavari
Manga
Indravati
Vamsdhara
Chilaka Lake
Bhima
Godavari
Rishikulya river
Olive Ridley Turtles
R. Krishna
R. Krishna
Kolleru Lake
Tungabhadra
Buckingham Canal
Hungry
Pennar
Jog Falls
(Sharavathi River)
Pulicat Lake
Kaveri
Palar
Bemand Lake

East Flowing Rivers

1. Damodar
- Chota Nagpur Plateau
- Flows in rift valley
- Tributary of Hugli → Distributary of Ganga
- Sorrow of Bengal
- Tributaries: Bokaro, Barakar, Konar

2. Subarnrekha: gold particles are seen in river
- Chota Nagpur Plateau (Randri Plateau)

3. Baitarani

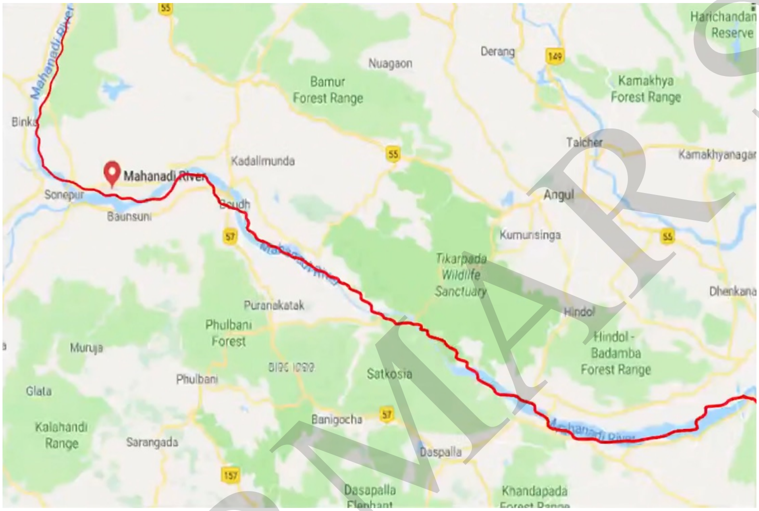

Allahabad
Benares
Patna
Son R.
R. Ganges
Ken R.
Rewa
Kaimur Range
Kanrer Ra.
Parasnath 4477 ft.
Son R.
Chota Nagpur
Plateau
Damodar R.
Howrah
Maikal Ra.
Subarnarekha R.
Wainganga R.
Mahanadi R.
Brahmani R.
Hooghly
Pt. Palmyras

4. Brahmani → Sankha + South Koel (tributaries)

5. Vamsdhara: nesting ground for Olive Ridley Turtles

6. Mahanadi

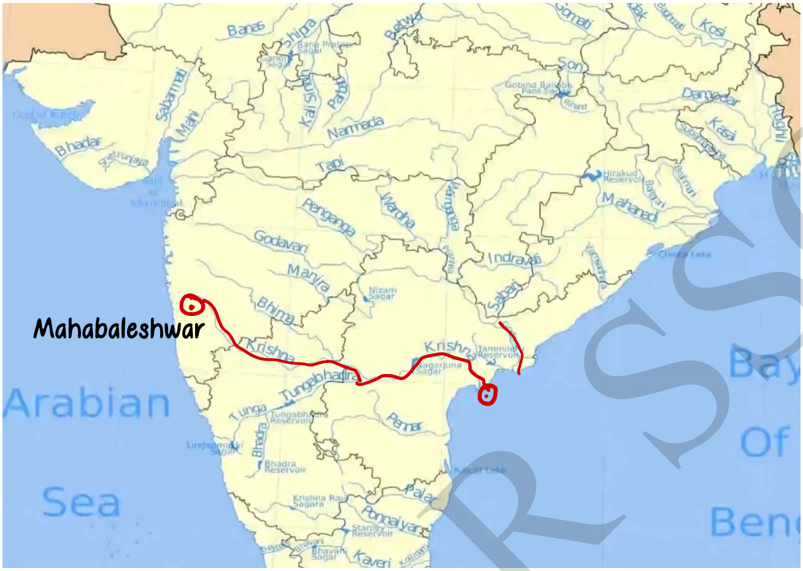
- Length: 850 km
- Sorrow of Odisha
- Sihawa Hills (Rampur, Chhattisgarh)
- Flows mainly in Chhattisgarh + Odisha (River basin spread across Jharkhand, Maharashtra , Madhya Pradesh)
- Dam built on this river: Hirakud Dam
- Tributaries: Tel, Jonk, Ong, Hasdeo, and Mand


Mahanadi River
Binka
Sonepur
Baunsuni
Mahanadi River
Kadalimunda
Boudh
Bamur Forest Range
Nuagaon
Derang
Harichandan Reserve
Kamakhya Forest Range
Talcher
Kamakhyanagar
Angul
Kumursinga
Tikarpada Wildlife Sanctuary
Dhenkanal
Hindol
Hindol - Badamba Forest Range
Puranakatak
Phulbani Forest
Phulbani
Muruja
Glata
Kalahandi Range
Sarangada
Satkosia
Banigocha
Daspalla
Dasapalla Elephant
Khandapada Forest Range
Mahanadi River
55
149
57
157

from Sahyadri, Western Ghats

7. Godavari

- Length: 1450 km
- Origin: Trimbakeshwar Plateau (Nasik, Maharashtra)
- Maharashtra → Telangana → Andhra Pradesh → Forms delta
- Rivers basin spread across: Chhattisgarh, Odisha, Madhya Pradesh, Karnataka
- Largest river of South India, Called as Dakshin Ganga
- Tributaries: Penganga, Wainganga, Wardha, Purna, Manjra, Indravati, Purna, Pranhita , Sabri


Banas
Shipra
Betwa
Gomati
Kosi
Son
Sabarmati
Mahi
Kali Sindh
Parbati
Narmada
Damodar
Bhadar
Tapi
Hirakud Reservoir
Mahanadi
Penganga
Wardha
Wainganga
Godavari
Manjra
Indravati
Bhima
Nizam Sagar
Sabari
Chilika Lake
Mahabaleshwar
Krishna
Tungabhadra
Nagarjuna Sagar
Tunga
Tungabhadra Reservoir
Bhadra
Bhadra Reservoir
Linganamakki Sagar
Penner
Palar
Krishna Raja Sagara
Ponnaiyar
Stanley Reservoir
Bhavani Sagar
Kaveri
Arabian Sea
Bay Of Beng

8. Krishna

- Length: 1400 Km
- Origin: Mahabaleshwar → Source: Sahyadri range
- Maharashtra → Karnataka → Telangana → Andhra Pradesh → Delta
- Second longest river of South India
- Tributaries: Bhima, Tungabhadra, Ghataprabha, Malaprabha, Musi, Konya, Dhoodhganga

TRICK

भीम तू मौसी को घाट धूध की माला

9. Pennar

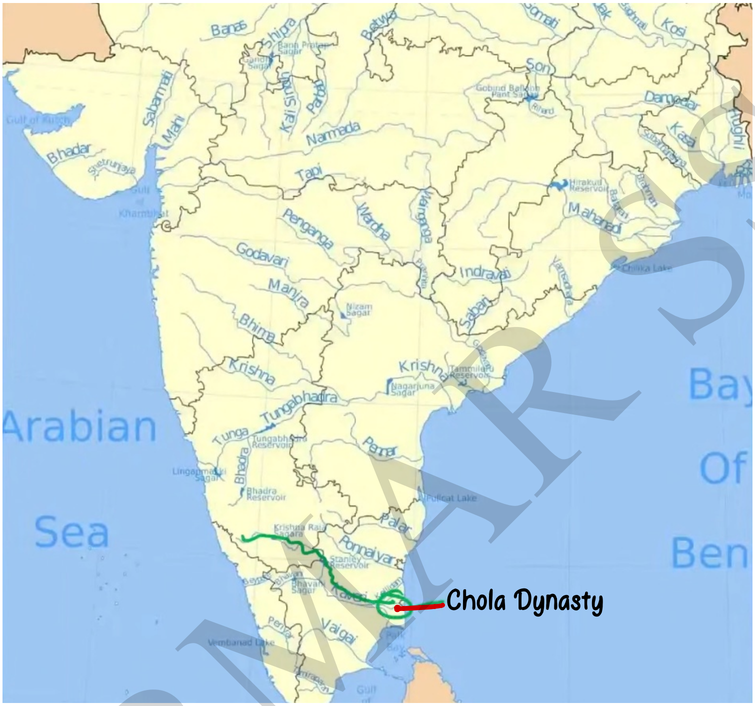
- Independent flowing rivers of Andhra Pradesh

10. Kaveri

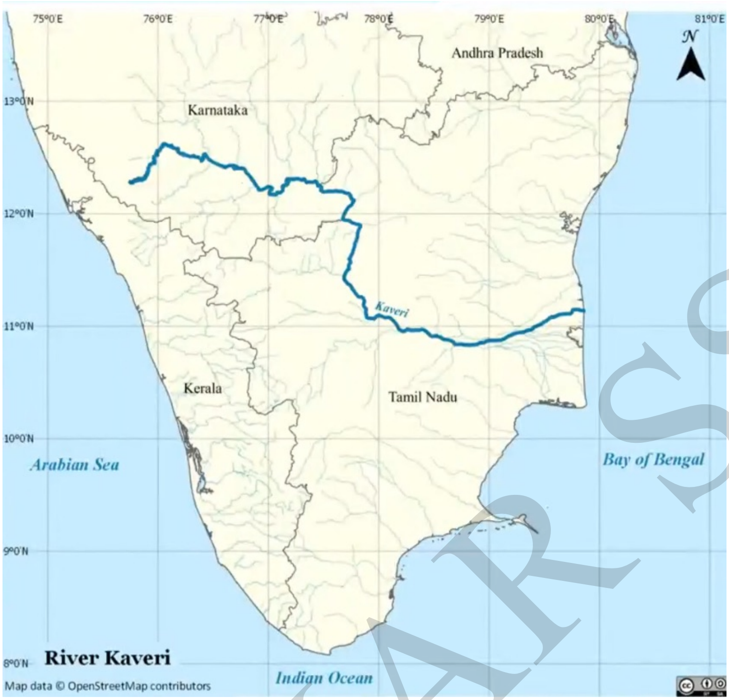
- Length: 800 km
- Origin: Brahamgiri Hills (Karnataka, Kodagu district)
- Karnataka → Tamil Nadu → Delta (Kerala)
- Only river of south India which flows throughout the year → Perennial river

Flow is like Ganga and tributaries resembles Ganga

- It is called Ganga of South India
- Tributaries: Hemvati, Kabini, Bhavani, Shimsha
- Delta: known as Garden of South India


Banas
Chambal
Betwa
Gomati
Son
Kosi
Damodar
Hughli
Sabarmati
Mahi
Kali Sindh
Parbati
Narmada
Tapi
Bhadar
Gulf of Kutch
Shetrunjaya
Gulf of Khambhat
Penganga
Wardha
Wainganga
Godavari
Manjra
Bhima
Indravati
Sabari
Mahanadi
Hirakud Reservoir
Chilika Lake
Nizam Sagar
Krishna
Nagarjuna Sagar
Tungabhadra
Tunga
Bhadra
Tungabhadra Reservoir
Bhadra Reservoir
Penner
Pulicat Lake
Palar
Ponnaiyar
Krishna Raja Sagara
Stanley Reservoir
Bhavani Sagar
Kaveri
Vaigai
Periyar
Vembanad Lake
Arabian Sea
Bay Of Ben
Chola Dynasty

10. Vaigai: Southern-most river of India


75°0'E
76°0'E
77°0'E
78°0'E
79°0'E
80°0'E
81°0'E
N
Andhra Pradesh
Karnataka
13°0'N
12°0'N
11°0'N
10°0'N
9°0'N
8°0'N
Kaveri
Kerala
Tamil Nadu
Arabian Sea
Bay of Bengal
Indian Ocean

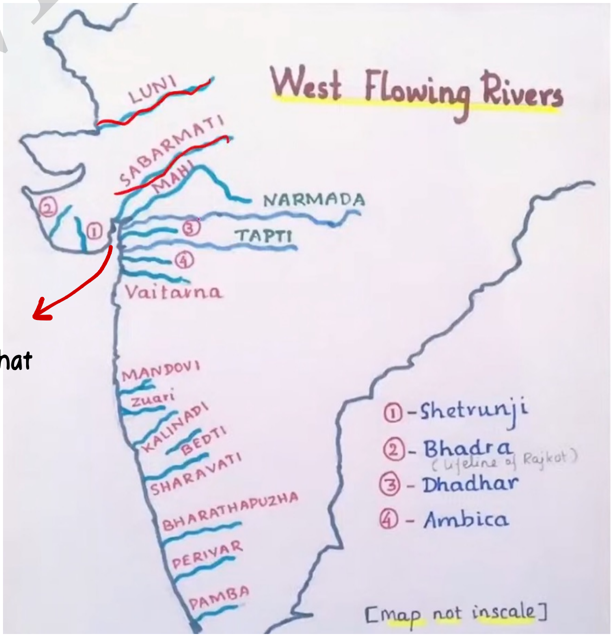
River Kaveri

Map data © OpenStreetMap contributors

→ West Flowing River

Flows into Arabian Sea

1. Luni River
2. Sabarmati
3. Mahi
4. Narmada
5. Tapti


West Flowing Rivers
LUNI
SABARMATI
MAHI
NARMADA
TAPTI
②
①
③
④
Vaitarna
MANDOVI
Zuari
KALINADI
BEDTI
SHARAVATI
BHARATHAPUZHA
PERIYAR
PAMBA
① - Shetrunji
② - Bhadra (Lifeline of Rajkot)
③ - Dhadhar
④ - Ambica
[Map not inscale]

Gulf of Khambhat

1. Luni River

- Origin: Nag Hills, Rajasthan
- Flows through: Rajasthan → Gujarat
- Only river that contains saline water
- They don't reach up to oceans and ends in Rann of Katchh

2. Sabarmati

- Origin: Aravalli mountains (Udaipur, Rajasthan)
- Flows through: Rajasthan → Gujarat
- Gandhinagar and Ahmedabad are located on its bank

3. Mahi

- Origin: Vindhya mountains
- Flows through: Madhya Pradesh → Rajasthan → Gujarat → Gulf of Khambhat
- This crosses Tropic of Cancer two times

4. Narmada

- Length: 1310 km
- Longest Western River flowing into Arabian Sea
- Origin: Amarkantak Plateau, Madhya Pradesh
- Flows through: Madhya Pradesh → Gujarat → Gulf of Khambhat
- Flows in rift valley, flows b/w Vindhya and Satpura
- Jabalpur is located on its bank
- Tributaries: Banjar, Tawa, Shakkar, Halon

5. Tapti

- Length: 724 km
- Origin: Betul Plateau, near Amarkantak Plateau (Madhya Pradesh)
- Surat is located on its bank
- Tributaries: Aner, Gomai, Girna, Purna

→ **Goa**

Rivers:

- Zuari
- Mandovi known as Lifeline of Goa, Panaji is located on its bank

→ **Kerala**

Rivers:

- Bharatphuza
- Periyar known as life line of Kerala, Longest river of Kerala
- Pamba drains into Vembanad lake

→ **Karnataka**

Rivers:

- Kalinadi and Sharavati

↓

Jog falls

- Source of river of Ghaggar: Himachal Pradesh

- Kaveri is known as "Pooni" in Tamil, fourth largest river flowing in Southeast direction through Karnataka and Tamil Nadu

- Does not drain into Bay of Bengal: Indus

- Headwater of river Ganga: Bhagirathi

- Allahabad: located on the confluence of river Yamuna and Ganga

- Decommissioned Havelock bridge built over: Godavari

- State that has largest catchment area of Godavari Basin: Maharashtra

- River that cover an area of 65,145 km^2 of which 80% lies in Maharashtra: Godavari

- Mahanadi basin doesn't extend to: Uttar Pradesh
- Second longest river of India that covers 10% of the country's area: Godavari
- River basin in Odisha: Mahanadi
- Sundarban Delta is created by Ganga-Brahmaputra rivers
- Tapti empties in Gulf of Cambay of the Arabian Sea, in state of Gujarat
- City not located on banks of river Ganga: Hazaribagh
- Cities that does not lie on the path of river Ganga: Lucknow
- Gandak river comprises of two rivers: Kaligandak and Trishulganga
- Wang Chu river is tributary of Brahmaputra and flows through Bhutan
- Branch of Godavari that joins Bay of Bengal flowing through Yanam enclave of the Union territory of Pondicherry: Gautami
- Mouth of Indus River lies to the north of the Tropic of Cancer
- Only large river in the Indian Desert: Luni River
- Ghagra rises in Nepal Himalayas

Flows through Venezuela, Brazil, Peru, Bolivia, Ecuador, Guyana, Suriname

- The largest Amazon river, is the 2nd longest river in the world, with a length of 6,400 km is located in the northern part of South America
- Longest river of the world: Nile called as Boon of Egypt

Only river that flows through one country

- The city of Sanghai is located at the mouth of the Yangtze River

World's 3rd longest river

- River that cuts Tropic of Capricorn twice: Limpopo river

- River that cuts Equator twice: Congo river

- Gharials are seen in Chambal River

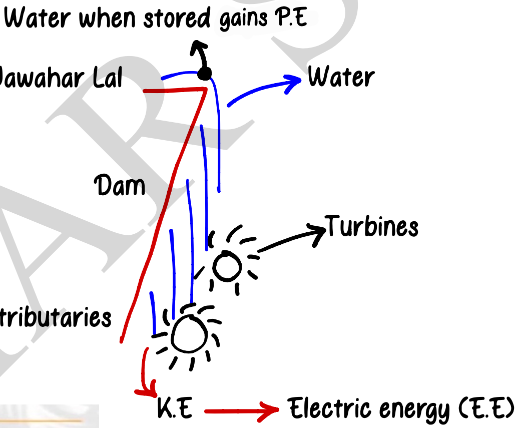
- Rank on the basis of Basin/Water discharge:
  1. Amazon
  2. Congo
  3. Ganga → Dolphins are found here

- Great rift valley is in Africa

DAMS, LAKES,
WATERFALLS

Hydroelectric Power Projects

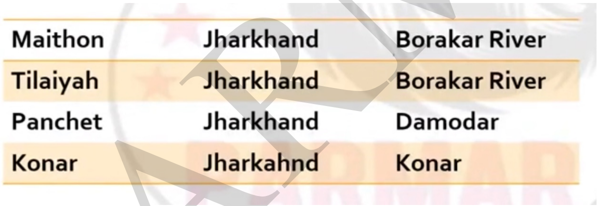
- **Multipurpose Project**
  Purpose: Flood control, hydropower generation, irrigation, tourism
- M.E = P.E + K.E
- **Potential Energy (P.E)**: P.E is the energy that is stored in an object in an object due to its position relative to some zero position
- **Kinetic Energy (K.E)**: form of energy that shows an object or a particle has by reasoning of its motion



- Mentioned as "Temple of Modern India" by Jawahar Lal Nehru

1. Damodar Valley Project

- India's first river valley project (1948)
- It is based on the Tennessee River of USA
- There are 8 dams built on Damodar and its tributaries



Maithon	Jharkhand	Borakar River
Tilaiyah	Jharkhand	Borakar River
Panchet	Jharkhand	Damodar
Konar	Jharkahnd	Konar

- Another type of Dam: Earthen Dam

2. Bhakra Nangal Project

- Constructed during First Five Year Plan
- Built on Sutlej river
- Made of two dams:
- Bhakra: Himachal Pradesh (Govind Sagar Lake from Bhakra Nangal Dam)
- Nangal: Punjab
- Highest Gravity Dam → bears forces on its own
- Largest Dam of India in terms of area
- Nathpa Jhakri Dam is also built on Sutlej in Himachal Pradesh

Dams

1. Rihand Dam

- Built on Rihand river (Tributary of Son)
- Govind Ballabh Pant Sagar Lake created from this dam
- Largest Artificial Lake of India

2. Hirakud Dam

- In Odisha, Sambalpur district
- Built on Mahanadi river
- Longest dam of world/India (4.8 km/25 km)

3. Tehri Dam

- In Uttarakhand
- Built on Bhagirathi river
- Highest Dam of India (261 m)

- Sunderlal Bahuguna

↓

Chipko Movement: against deforestation

Anti-Tehri Movement

4. Farakka Dam

- In West Bengal, built on Ganga river
- This dam was built to provide water to the Hooghly river

3. Vyas River Project

- Harike Dam was built through this project in Punjab (Kapurthala)
- Sutlej and Vyas meets here
- An Indira Gandhi Canal was constructed from it

↓

Has the largest irrigation facility

State-wise

Jammu and Kashmir

- Dulhasti Hydroelectric Project
- Salal Hydroelectric Power Station

All on Chenab river

→ highest railway bridge is constructed on Chenab river near Salal hydroelectric project → Chenab Rail Bridge

- Baglihar Hydroelectric Project → On Chenab river

- Kishan Ganga
- Tulbul
- Uri

All on Jhelum river

Himachal Pradesh

- Pong Dam (Maharana Pratap Sagar): Beas river
- Chamera Dam: Ravi river

Uttar Pradesh

- Matatila Dam
- Lakshmibai Dam

Betwa river

- Rihand Dam: Rihand river (Govind Ballabh Pant Sagar Reservoir)

Gujarat

- Ukai Dam: Tapi river
- Kakrapar Dam: Tapi river
- Sardar Sarovar Dam: Narmada river

Madhya Pradesh

- Tawa Dam: Tawa river (tributary of Narmada)
- Ban Sagar Dam: Son river
- Omkareshwar Dam: Narmada river
- Indira Sagar Dam: Narmada river
- Gandhi Sagar Dam: Chambal river

Rajasthan

- Mahi Bajaj Sagar Dam: Mahi river
- Bilaspur Dam: Banas river
- Rana Pratap Sagar Dam: Chambal river

- Jawahar Sagar Dam (on Chenab river)

Maharashtra

- Jayakwadi Dam: Godavari river
- Dhom Dam: Krishna
- Koyna Dam (largest dam of Maharashtra): Koyna river
- Panchet Dam: Damodar river

Chhattisgarh

- Indravati Dam: Godavari river

Karnataka

- Jog/Mahatma Gandhi Dam: Sharavati river
- Linganamakki Dam: Sharavati river
- Shivsamudram Dam: Kaveri river
- Almatti Dam: Krishna river

Kerala

- Periyar/Mullaperiyar/Idukki Dam: Periyar (life line of Kerala)

Many dams are constructed on it

Telangana

- Pochampad/Sriram Sagar/Kaleshwaram Lift Irrigation Project : Godavari river

Tamil Nadu

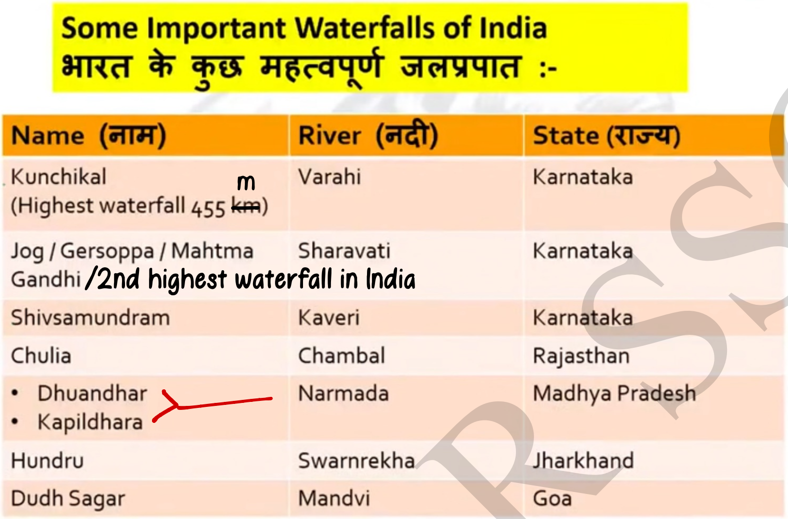
- Pykara Dam: Pykara river
- Mettur Dam: Kaveri river

Andhra Pradesh

- Srisailam Dam
- Nagarjuna Sagar Dam

Krishna river

Waterfalls in India

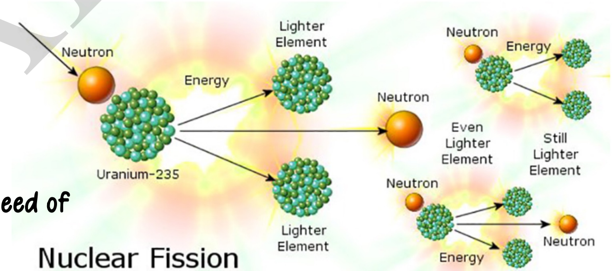


Some Important Waterfalls of India
भारत के कुछ महत्वपूर्ण जलप्रपात :-

Name (नाम)	River (नदी)	State (राज्य)
Kunchikal (Highest waterfall 455 ~~km~~ m)	Varahi	Karnataka
Jog / Gersoppa / Mahtma Gandhi /2nd highest waterfall in India	Sharavati	Karnataka
Shivsamundram	Kaveri	Karnataka
Chulia	Chambal	Rajasthan
• Dhuandhar • Kapildhara	Narmada	Madhya Pradesh
Hundru	Swarnrekha	Jharkhand
Dudh Sagar	Mandvi	Goa

- Highest waterfall in the world: Angel waterfall in Venezuela
- 2nd highest in the world: Niagara Falls (in USA-Canada border)
- Niagara of India: Chitrakote waterfall in Chhattisgarh

- Nuclear Power Plants: where energy is generated through Nuclear Fission, in which Uranium and Thorium atoms are used, during nuclear fission, a neutron collides with such atoms and splits it, releasing a large amount of energy in the form of heat and radiation


Neutron
Energy
Lighter Element
Uranium-235
Lighter Element
Neutron
Neutron
Energy
Even Lighter Element
Still Lighter Element
Neutron
Neutron
Energy

Nuclear Fission

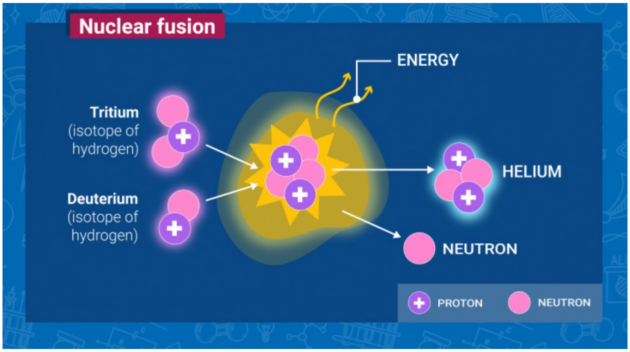
→ becomes self-sustaining

↳ chain reaction

or to reduce the speed of neutrons

Heavy water

- Moderators later used to control chain reactions: D_2O, Graphite
- Coolant: typically liquid to reduce or regulate the temperature of a system, for example: H_2O, D_2O, liquid Sodium


Nuclear fusion
ENERGY
Tritium
(isotope of hydrogen)
Deuterium
(isotope of hydrogen)
HELIUM
NEUTRON
PROTON
NEUTRON

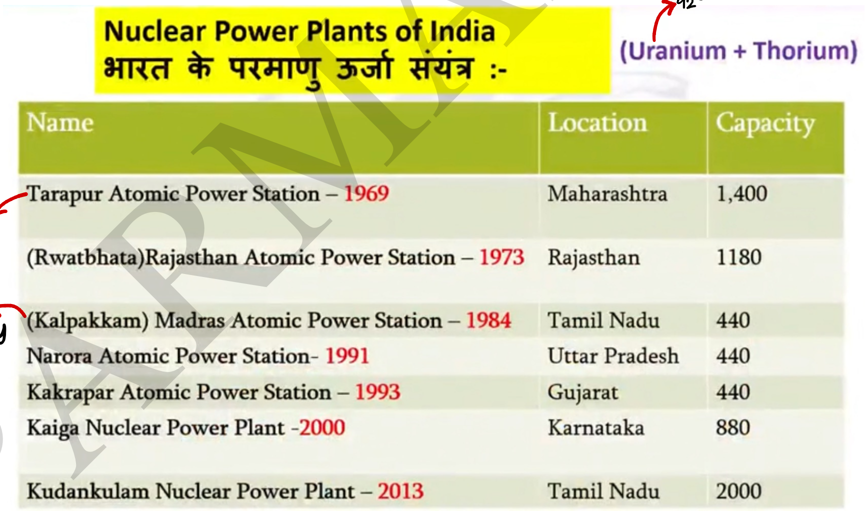
- Concept used in making Hydrogen Bombs

- Homi J. Bhabha is known as the "Father of Indian Nuclear Programme"/"Father of Atomic Energy"

- India's first nuclear power reactor: Apsara (Trombay, Mumbai, 1956)

- 1st completely indigenously built nuclear power plant: Kalpakkam

$^{232}_{92}U$



Nuclear Power Plants of India
भारत के परमाणु ऊर्जा संयंत्र :-

(Uranium + Thorium)

Name	Location	Capacity
Tarapur Atomic Power Station – 1969	Maharashtra	1,400
(Rwatbhata)Rajasthan Atomic Power Station – 1973	Rajasthan	1180
(Kalpakkam) Madras Atomic Power Station – 1984	Tamil Nadu	440
Narora Atomic Power Station- 1991	Uttar Pradesh	440
Kakrapar Atomic Power Station – 1993	Gujarat	440
Kaiga Nuclear Power Plant -2000	Karnataka	880
Kudankulam Nuclear Power Plant – 2013	Tamil Nadu	2000

1st

1st indigenously built

- Chernobyl Disaster: 26 April 1986

Lakes of India

- An artificial lake named Govind Sagar was created in 1976 by a huge hydroelectric power dam in Bhakra on the Sutlej river

- Pushkar Lake is situated in Ajmer, Rajasthan

- Lake that is the result of Asteroid impact: Lonar Lake in Maharashtra
  - Crater lake

- Wular Lake: largest freshwater lake in India, also the result of tectonic activity

- Barapani Lake: Also known as Umiam Lake, in Shillong, Meghalaya

- Tsomgo lake is a glacial lake located in Sikkim

- Bhushi lake is in Maharashtra

- Bhojtal, formerly known as Upper lake is situated in Madhya Pradesh
  - constructed by Raja Bhoj (Parmar Dynasty's most famous and powerful ruler) → Also established Bhopal city

- Anchar lake is in Jammu and Kashmir

- Kolleru lake is located in Andhra Pradesh, situated delta that is formed between Godavari and Krishna

- Pulicat lake: b/w Andhra Pradesh and Tamil Nadu, India's 2nd largest Brackish water lake

- Largest Brackish water lake: Chilika Lake
  - 1st Ramsar site
  - Brackish → fresh water+salt water
  - largest saline water lake

- Largest Inland Salt water lake: Sambhar lake, Rajasthan
  - salinity more than Chilika but area less than Chilika
    - Chilika → Odisha

- Renuka lake located in Himachal Pradesh

- Loktak lake: world's only floating lake in Manipur

- Suryadhar lake is located in Uttarakhand
- Pangong Tso, Tso kar, Tso Moriri: Salt water lake
  - in Aksai Chin border
- Sur Sarovar, also known as Keetham lake, is a man-made reservoir added to list of Ramsar
- Site in the year 2020
- Kanwar Tal in Bihar: Ramsar Site, 2022
  - largest Ox bow lake
- Thol lake, Gujarat: Ramsar Site, 2021
- Wadhwana wetland, Gujarat: Ramsar Site, 2021
- Nizam Sagar Dam located in Telangana on Manjira river
  - by Hyderabad Nizam

- Ramsar, Iran Convention in 1971 on wetlands
- Schemes launched for Wetland and Mangrove Conservation on World Environment Day:
  1. Amrit Dharohar Yojana
  2. MISHTI (Mangrove initiative for Shoreline Habitats and Tangible Incomes)

- Nagarjuna Sagar Dam is on Krishna river
- Barrage/Dam closest to India-Bangladesh border: Farakka Barrage
- Maithon Dam in Jharkhand constructed over Barakar river
- Diamer Basha Dam is constructed by Pakistan on Indus River
- Tawa Dam: Madhya Pradesh
- Ujjani Dam: Maharashtra
- Isapur Dam is in Maharashtra on Penganga river
- Tehri Dam is multi-purpose rock and earth-fill embankment dam on the Bhagirathi river

- Thein Dam is on Ravi river, also called as Ranjit Sagar Dam
- Hundru waterfall in Subarnarekha river
- Kunchikal waterfall, highest waterfall in India is on Varahi river
- Dudhsagar waterfall is in Goa
- Bhambavli Vajrai Waterfall is located in Maharashtra, Satara district
- Khandadhar waterfall: Odisha
- Chulia waterfall is situated on Chambal river in Rajasthan
- Duduma waterfall is in Odisha
- Gokak waterfall is in Ghatprabha river (tributary of Krishna) in Karnataka

MONSOON/FORESTS

- **Factors affecting climate of India**
  1. Latitude
  2. Altitude
  3. Pressure and wind system
  4. Relief features
  5. Ocean Currents
  6. Distance from Sea

- **Climate**: the average weather in a given area over a longer period of time. Data taken of 30 years

- **Weather**: the term refers to temporary conditions of the atmosphere, including temperature, atmospheric pressure, wind, humidity, precipitation, and cloud cover

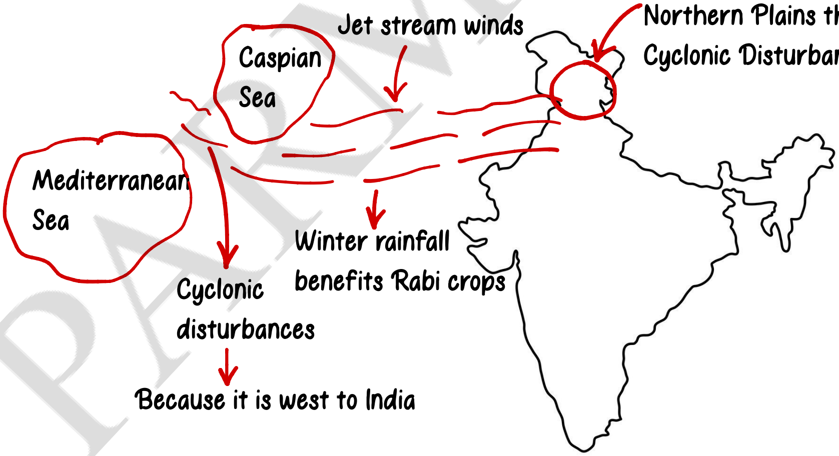
Winter Season

Chilling winds from Arctic/Central Asia affects winter season

Winter Rainfall

It is known as Upper atmospheric Circulation

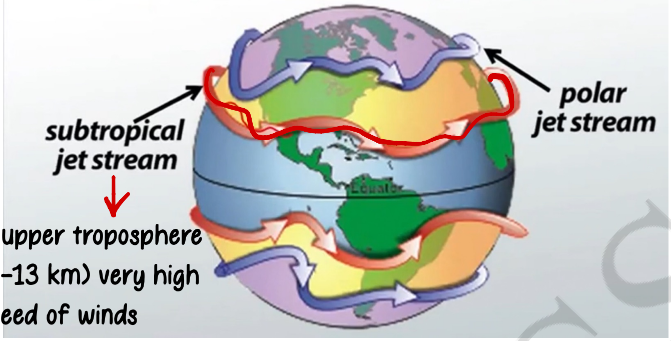
rainfall caused by jet streams in Northern Plains that carries Western Cyclonic Disturbances



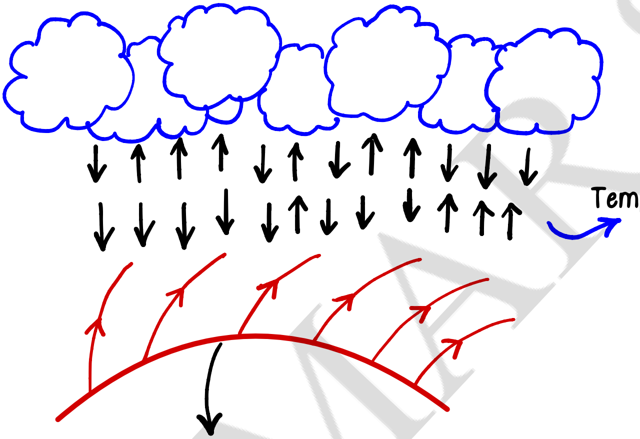
Winter rainfall benefits Rabi crops

Because it is west to India

Inward of Western Disturbances through jet streams is marked by increase in prevailing night temperature


subtropical jet stream
polar jet stream
Equator

In upper troposphere (9-13 km) very high speed of winds



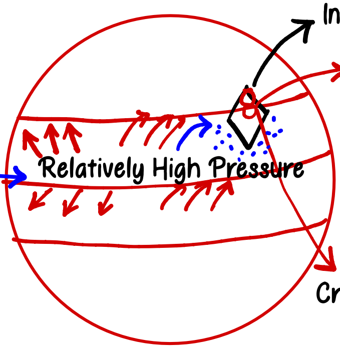
Temperature inversion

Hot during day but at night radiates terrestrial radiation

Summer Season

ITCZ now shifts in upper region

- Trade winds meet and air ascends
- During July: 20°-25°N


Relatively High Pressure

India

Summer rays over Tibetan Plateau

Intense heating

Creates low pressure

Also in Indian Peninsula

Pre-Monsoon Showers

Nor-Westers

Kal Baisakhi

Calamity in the month of Baisakh in West Bengal

helpful for growth of jute, tea

Bardoli Chheerha

In Assam

Blossom Showers

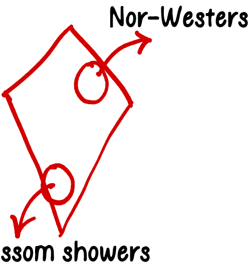
Seen in Kerala/ Karnataka

Helps in growth/cultivation of coffee

Mango Showers

Seen in Kerala

Helps in early ripening of mangoes

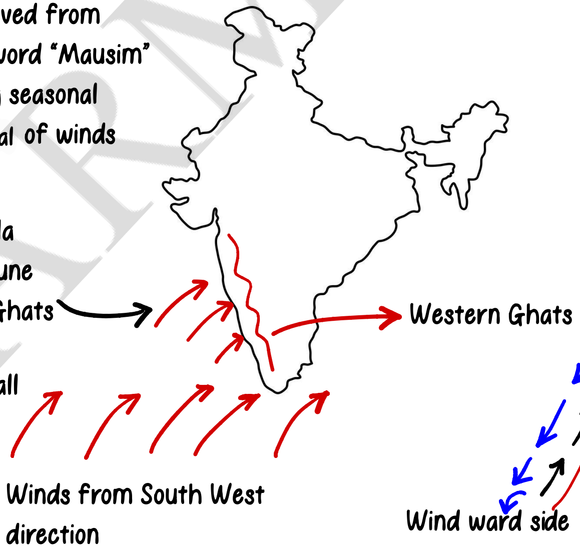

Nor-Westers
Blossom showers

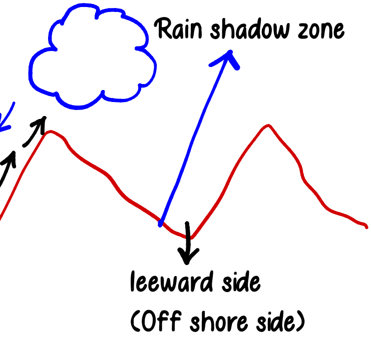
- ## On Set of Monsoon

It is derived from Arabic word "Mausim" meaning seasonal reversal of winds

Begining in Kerala in 1st week of June in the Western Ghats

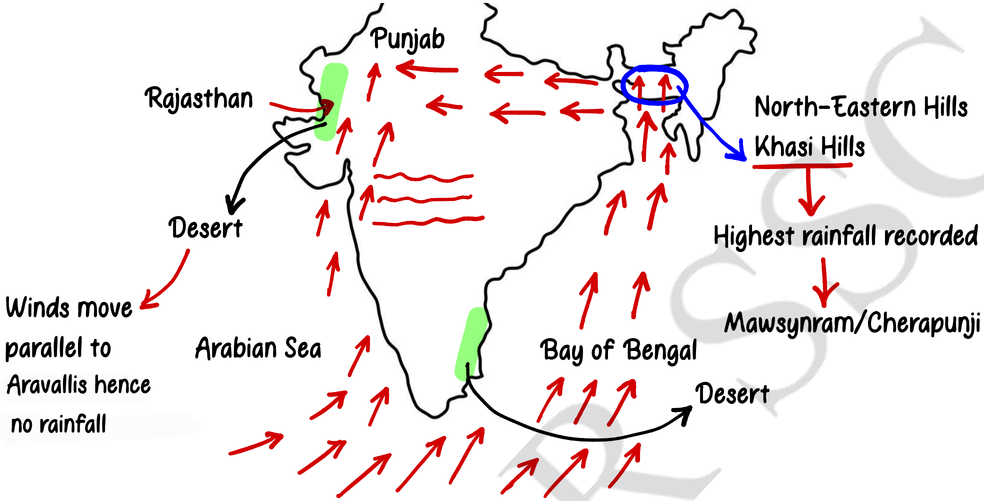
Orographic rainfall


Western Ghats
Winds from South West direction


Rain shadow zone
leeward side
(Off shore side)

Wind ward side (On shore side)

Rain Bearing System


Punjab
Rajasthan
North-Eastern Hills
Khasi Hills
Highest rainfall recorded
Mawsynram/Cherapunji
Desert
Winds move parallel to Aravallis hence no rainfall
Arabian Sea
Bay of Bengal
Desert

- Bay of Bengal branch and Arabian Sea branch of South West Monsoon meet at Punjab

Break in Monsoon

↓

Sudden decrease in rainfall after the onset of monsoon

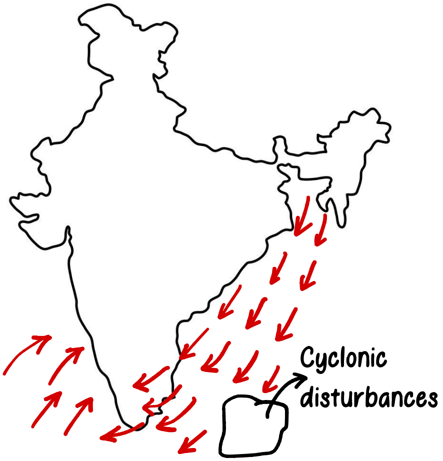
Retreating monsoon

↓

Also known as North-East Monsoon and it causes rainfall over Coromandel coast (Tamil Nadu/Andhra)

↓

Flood in Chennai


Cyclonic disturbances

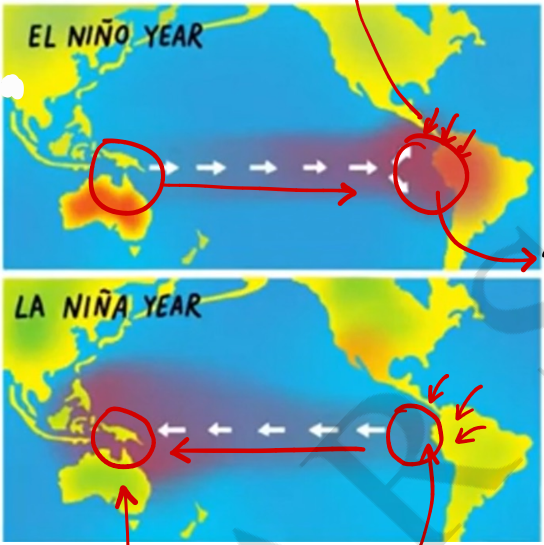
In North India

- Clear skies
- October heat: oppressing heat

Effect of El-Nino in Monsoon

- Seen in 3-7 yrs
- Adversely affects the monsoon

North East winds weakens thus water returns


EL NIÑO YEAR
LA NIÑA YEAR

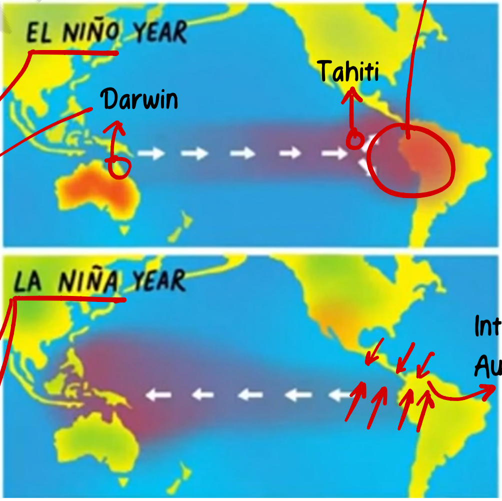
Rainfall

Warm current

Fishing Industry won't flourish
No rain in Australia and India

Ocean Water

- Surface water
- Deep water


EL NIÑO YEAR
Tahiti
Darwin
LA NIÑA YEAR

Meaning: Child Christ/Small boy

- They measure the pressure difference b/w Tahiti and Darwin
- If the pressure difference is negative then El Niño will happen

Intense rainfall in Australia and India

Meaning: Small girl

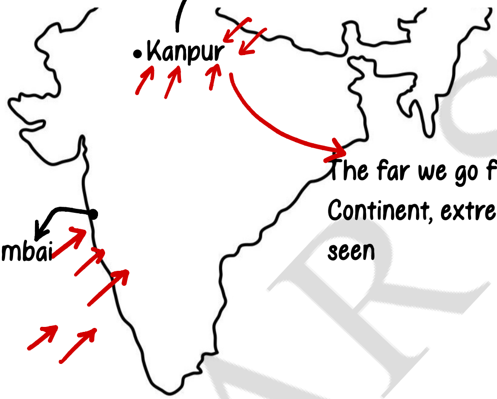
Opposite to that of El Nino

Variation in Temperature/Rainfall

1. Diurnal Range of Temperature
2. Annual Range of Temperature
3. Annual Range of Rainfall

More in the interior of Continents and less in the the coastal cities

Extremities of Climate seen



The far we go from Ocean into the Continent, extremities of Climate is seen

Extremities of Climate not seen

Because it is a coastal city.

Why?

1. Continentality effect
2. Moderating influence of Sea

Seasons and Months

Seasons	Months (According to the Indian Calendar)	Months (According to the Indian Calendar)
Vasanta	Chaitra-Vaisakha	March-April
Grishma	Jyaistha-Asadha	May-June
Varsha	Sravana-Bhadra	July-August
Sharada	Asvina-Kartika	September-October
Hemanta	Margashirsa-Pausa	November-December
Shishira	Magha-Phalguna	January-February

Forests

1. Evergreen Forests → Eastern Himalayas

- These are layered forests (shed there leaves not all together)
- They are seen in places of high temperature and high rainfall

temperature ↓ 30°C↑   rainfall ↓ 200 cm↑

- In India, seen in Western side of Western Ghats, Andaman and Nicobar Islands, North-East
- Highest biodiversity seen here
- Eg: Amazon Rainforests (known as "Lungs of the World ")

- Vegetation seen: Rosewood, Ebony, Mahogany, Cinchona, Aini, Epihytes
- Also known as Desert covered by forest

2. Tropical Deciduous Forest

- Rainfall: 70 cm-200 cm
  - → 70-150 cm: Dry Deciduous
  - → 150-200 cm: Moist Deciduos
- Also known as Monsoon Forests
- These are the most predominant forests in India
- They are seen in: Peninsular Plateaus, North Indian Plains
- Trees:

Moist Deciduous: Shisham, Sagon, Sandalwood, Teak, Sal

Dry Deciduous: Tendu, Khair, Palas

↓ Leaves are used to make Bidi

- Guttation: Hydathodes

3. Tropical Thorn Forests

- Rainfall: less than 50 cm
- Thorns are modified form of leaves (to avoid water loss)
- Trees: Babul, Khejri, Cactus
- Special type of grass seen here: Tussocky grass
- In India: seen in Rajasthan, Punjab, Gujarat

4. Coniferous Forest
- Shape: Cone
- Seen in areas of high snowfall
- In India: seen in Upper Himalayas
- Trees:

Softwood trees: Chir, Pine, Cedar, Deodar, Spruce

↓

Gymnosperms

target: 33% (India)

↑

- National Forest Policy: 1952 → 1988
- Chipko Movement: 1978, led by Sundarlal Bahuguna
- Forest Day: 21st March
- Indian Forest Research Institute located in Dehradun, Uttarakhand

5. Montane Forests
- In mountain region
- Categories:

1. North India: seen in Himalayas → Bugyal Grassland seen

a. Upper part: Alpine/Coniferous m, eg: Rhododendron

b. Lower part: Deciduous forests

2. South India

Evergreen forests seen here due to rainfall

Sholas seen here → Grassland/Forests of Western Ghats

India State Forest Report: tells about the total Forest cover in India
- Biennial Report
- Forest Cover: 21.71%
- Tree Cover: 2.9%
- Forest and Trees: 24.62%

→ 2021 report

- Highest Forest cover (area): Madhya Pradesh (1st), Arunachal Pradesh (2nd)
- Highest Forest cover (%): Mizoram (1st), Arunachal (2nd)
- Lowest Forest cover: Haryana
- Highest increase: Andhra Pradesh
- Highest decrease: Arunachal > Manipur

6. Mangrove Forests
- Known as Littoral/Swamp forests
- Seen in coastal areas
- More in Sundarban Deltas → Sundari Trees
- Region: West Bengal
- They are called living roots
- Trees are viviparous

Grasslands

Tropical grasslands

Elephant grass but not nutritious

1. Savannah: in Africa
2. Campos grassland: Brazil
3. Llanos grassland: Venezuela

Known as Big Game country due to extreme poaching of animals

Temperate grasslands

Small grass but nutritious

1. Prairies: North America
2. Steppes: Asia/Europe
3. Velds: South Africa
4. Downs: Australia
5. Pustaz: Hungary
6. Canterbury: New Zealand
7. Pampas: Argentina

- Prairies: Known as wheat granaries of the world
- Pampas: grass seen "Alpha alpha grass" → nutrient rich grass

Shifting Cultivation

- It is known as Slash and Burn Agriculture
- Notgood for environment, causes deforestation and soil loses it's productivity

Across the world known by different names:

1. Indonesia: Ladang
2. Mexico: Milpa
3. Sri Lanka: Chena
4. Vietnam: Ray
5. Brazil: Roca
6. Venezuela: Konuko

Across the India

1. Jhum: North East
2. Kumari: Western Ghats
3. Pama Dabi/Bringa: Odisha
4. Penda/Podu: Andhra Pradesh
5. Dipa: Chhattisgarh (Bastar district)
6. Waltre: Rajasthan
7. Kuruwa: Jharkhand
8. Bewar/Dahiya: Madhya Pradesh

SOIL AND NATIONAL PARKS/ BIOSPHERE RESERVES

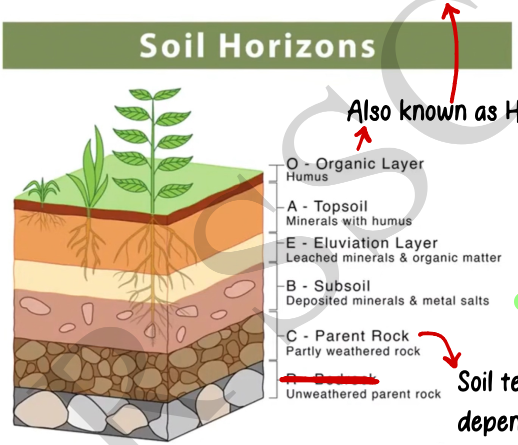
Soil

Factors for the formation of soil:

1. Parent Rock
2. Climate
3. Time
4. Topography

a. 1 & 2
[✓ b.] 1, 2, 3
c. All
d. 1, 3, 4

mostly missing in Indian soil


Soil Horizons
O - Organic Layer
Humus
A - Topsoil
Minerals with humus
E - Eluviation Layer
Leached minerals & organic matter
B - Subsoil
Deposited minerals & metal salts
C - Parent Rock
Partly weathered rock
~~R - Bedrock~~
Unweathered parent rock

Also known as Humus

O
A
B
C

Soil texture depends on Parent Rock

Weathering is an in situ process

- Study of Soil: Pedology

- ICAR: Indian Council of Agricultural Research
- HQ: New Delhi
- This institute has categorised soil into 8 categories
- Indian Soils lack: N_2, P, Humus (organic matter)

Categories:

1. Alluvial soil: 40%
2. Red soil: 18%
3. Black soil: 15%
4. Laterite soil: 4.3%
5. Desert soil
6. Montane soil
7. Marshy/Peaty soil
8. Alkaline soil

more imp**

1. Alluvial Soil

Uttar Pradesh, Bihar, West Bengal, Assam

- Covers 40% area of India (In India, most fertile type of soil)
- Found in Northern Plains + Deltas of Peninsular rivers
- Rich in Potash and poor in Phosphorus

- Formed due to sediments deposited by rivers

They are of two types:

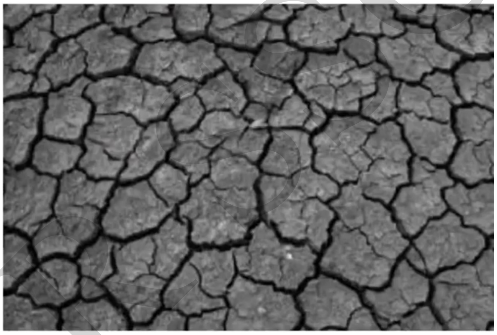
1. Khadar: New Alluvium, more fertile
2. Bhangar: Old Alluvium, less fertile

2. Black Soil (15%)

- It is formed due to eruption of lava
- Found in North Western part of Peninsular Plateau
  - Maharashtra, Gujarat
- Also known as Regur
- Clayey in nature
- It is impermeable soil (high water holding capacity)
- It develops cracks when dry and sticky when moist

↓

Self-ploughing characteristics



- Most suitable soil for cotton cultivation

↓

requires 210 frost free days

- They are rich in Iron, lime, Alumina

- Loamy Soil: sand content is more

3. Red Soil (18%)

- Formed by the weathering of the metamorphic rock
- It is red due to presence of Iron Oxide
- Changes colour to yellow on hydration
- It is found in water deficit region: Karnataka, Tamil Nadu, Maharashtra, Piedmont Zone of Western Ghats
- In low rainfall areas

4. Laterite Soil (4.3%)

- It is formed by leaching process (where important minerals such as Silica washes away with the soil)
- Found in regions of high temperature and high rainfall
- It is known as Brick Soil

- Good for Cashew growth and cultivation
- Found in Tamil Nadu, Andhra Pradesh, Kerala

5. Marshy/Peaty Soil

- Seen in coastal areas
- Has organic matter/humus
- It is seen in regions of high humidity and high rainfall

6. Desert Soil

- Seen in extremely low rainfall areas (<50 cm): Western Rajasthan, Gujarat, Haryana

7. Montane/Forest Soil

- High humus is seen

National Parks	Biosphere Reserves
Fixed boundary	Fixed boundary
Limited human activity allowed	Human activity is allowed to a certain level
Protects flora, fauna, landscape	It has three zones: · Core · Buffer · Manipulation

National Parks

Assam

Manas Na Meri Kazi करवादी मेरी शादी

Manas NP Nameri NP Kaziranga NP Dihang NP

Kaziranga NP → Famous for One-horned Rhino

Aurang Sheikh के साथ

Orang NP Dibru Saikhowa NP

→Raimona National Park (notified in 2021)

→Dihing Patkai National Park (notified in 2021)

West Bengal

WB की Jalpari Nora Single है और

Jaldapara NP Neora Valley NP Singalila NP

बड़ी सुंदर और गोरी है लेकिन

Sunderban NP Gorumara NP

Boxer है

Buxa NP

Madhya Pradesh

MP के Sanjay और माधव अपने Bandhu

Sanjay Gandhi NP Madhav NP Bandhavgarh NP

कान्हा से मिलने Paanch पैसे लेकर

कान्हा ↓ Kanha NP
Paanch ↓ Pench NP

Paan खाकर Monday को Saat बजे

Paan ↓ Panna NP
Monday ↓ Mandla Plant Fossil NP
Saat ↓ Satpura NP

Van से पहुंचे

Van ↓ Van Vihar NP

Rajasthan

Raja Mukund is Running in Saree in Desert

Mukund ↓ Mukundra Hills NP
Running ↓ Ranthambore NP
Saree ↓ Sariska NP
Desert ↓ Desert NP ↓ Great Indian Bustard (state animal)

लेकिन क्यो ?

क्यो ↓ Keoladeo NP

Uttar Pradesh

UP के Pilibhit के Nawab की बेटी Chandraprabha

Pilibhit ↓ Pilibhit Tiger Reserve
Nawab ↓ Nawab gang Bird Sanctuary
Chandraprabha ↓ Chandra Prabha WS

को Chambal के किनारे Dudh से

Chambal ↓ Chambal WS
Dudh ↓ Dhudhwa NP

नहाते हुए देखा गया

Uttarakhand

1. Jim Corbett NP: India's first NP, estd. in 1936, Project Tiger 1973 started from here
↓
Old names: Hailey's National Park → Ramganga NP
2. Rajaji NP
3. Nanda Devi NP
4. Valley of Flower NP
5. Gangotri NP

- Project Elephant: 1992

Gujarat

Gujarat मे Meri Black Van Beach पर

Meri ↓ Marine NP
Black ↓ Blackbuck NP
Van ↓ Vansda NP

Gir गई
↓
Gir NP
↳ Famous for Asiatic Lions

Himachal Pradesh

1. Pin Valley NP
2. Simbalbara NP
3. Great Himalayan NP
4. Khirganga NP
5. Inderkila NP

Jammu and Kashmir, Ladakh — State animal: Snow Leopard

1. Hemis NP: largest National Park
2. Salim Ali NP
3. Dachigam NP
4. Kishtwar NP

- Salim Ali Bird Sanctuary: Goa

Kerala

1. Eravikulam NP
2. Periyar NP
3. Silent Valley NP

Tamil Nadu

1. Annaimudi NP
2. Mudumalai NP
3. Guindy NP
4. Indira Gandhi NP
5. Gulf of Mannar NP
6. Palani NP

Karnataka

1. Rajiv Gandhi NP (Nagarhole NP) → रजीव नगर के कूड़े का एक अंश भी बैन है।
2. Kudremukh NP
3. Anshi NP
4. Bannerghatta NP

Sikkim

1. Kanchenjunga NP

Bihar

1. Valmiki Tiger Reserve

Odisha

1. Bhitarkanika NP
2. Simplipal NP

Jharkhand

1. Palamu NP
2. Betla NP

Chhattisgarh

1. Indravati NP
2. Kanger Valley NP
3. Guru Ghasidas NP

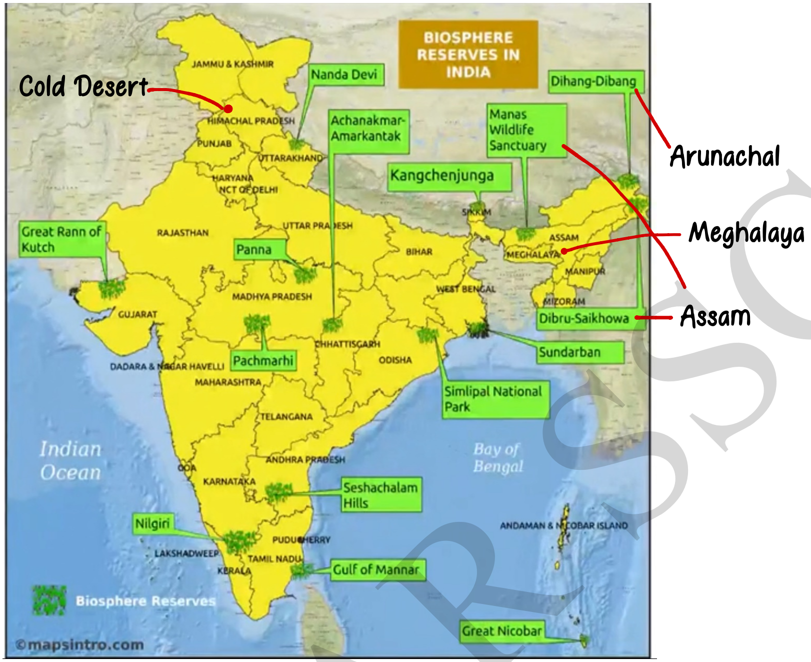
famous for Sanghai Deer

Manipur

1. Keibul Lamjao NP (World's only floating NP on Loktak Lake)

Biosphere Reserves

- Total: 18
- 12 UNESCO Biosphere Reserves: Man and Biosphere programme (MAB), 1971


BIOSPHERE RESERVES IN INDIA
Cold Desert
JAMMU & KASHMIR
Nanda Devi
Dihang-Dibang
Arunachal
HIMACHAL PRADESH
Achanakmar-Amarkantak
Manas Wildlife Sanctuary
PUNJAB
UTTARAKHAND
Kangchenjunga
HARYANA
NCT OF DELHI
SIKKIM
Meghalaya
Great Rann of Kutch
RAJASTHAN
UTTAR PRADESH
ASSAM
Panna
BIHAR
MEGHALAYA
MANIPUR
WEST BENGAL
MIZORAM
MADHYA PRADESH
GUJARAT
Dibru-Saikhowa
Assam
CHHATTISGARH
Sundarban
Pachmarhi
DADARA & NAGAR HAVELI
ODISHA
MAHARASHTRA
Simlipal National Park
TELANGANA
Indian Ocean
Bay of Bengal
ANDHRA PRADESH
GOA
KARNATAKA
Seshachalam Hills
ANDAMAN & NICOBAR ISLAND
Nilgiri
PUDUCHERRY
LAKSHADWEEP
TAMIL NADU
KERALA
Gulf of Mannar
Biosphere Reserves
Great Nicobar
©mapsintro.com

- Nilgiri Biosphere Reserves: 1st Biosphere Reserve to be included under MAB
- Largest: Great Rann of Kutch

- Under UNESCO, MAB:

1. Nilgiri – Extended to 3 states → Kerala, Tamil Nadu, Karnataka
2. Gulf of Mannar
3. Sundarban
4. Nanda Devi
5. Nokrek
6. Panchmarhi
7. Simplipal
8. Achanakmar-Amarkantak (Chattisgarh-Madhya Pradesh border
9. Great Nicobar
10. Agasthyamalai → Added under MAB in 2018
11. Kangchenjunga – Highest mixed first World Heritage
12. Panna (latest added)

- National Commission on Agriculture (1976) of India has classified forestry into 3 categories:
  1. Urban Forestry
  2. Rural Forestry
  3. Farm Forestry

- In 1972, West Bengal Forest Department recognised its failures in reviving Sal forests in South Western districts of the State

- Coringa is a beautiful Mangrove forests where the Godavari joins the backwaters of Bay of Bengal (Godavari and in backwaters of Bay of Bengal)

- Littoral forests (Mangrove forests): Sundari trees

- Nallamala range of Forests: Andhra Pradesh-Telangana

- Moist Tropical Forests: Bamboo, epiphytes, Aini, semul, gutel and mundane

- Mid latitudinal coastal region: Temperate Evergreen Forest

- Hubbardia heptaneuron: a species grass which is on the verge of extinction due to its insensitivity towards the environment

- Temperate grasslands: ideal for wheat

- Roaring forties: other names — Shrieking sixties, furious fifties
  It's in Southern Hemisphere because of less landmass
  → Westerlies in SH

- Largest tropical rainforest in the world: Amazon

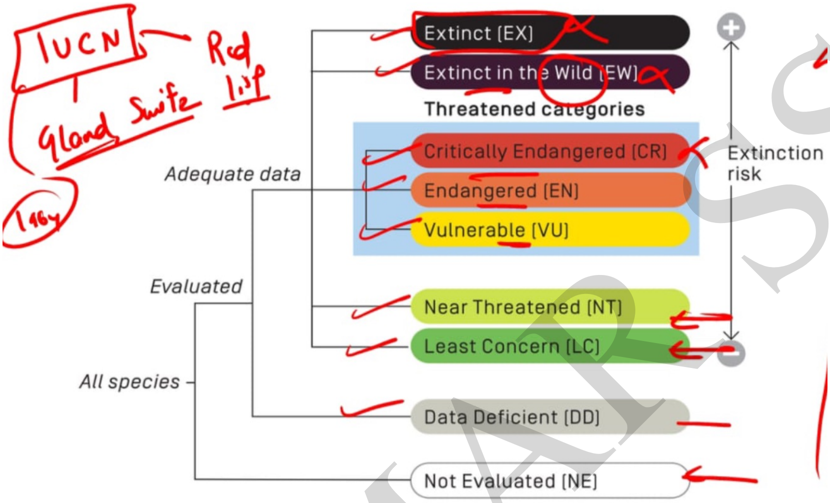
- Artificial ecosystems: Garden

- Biotic component of an ecosystem: Wind

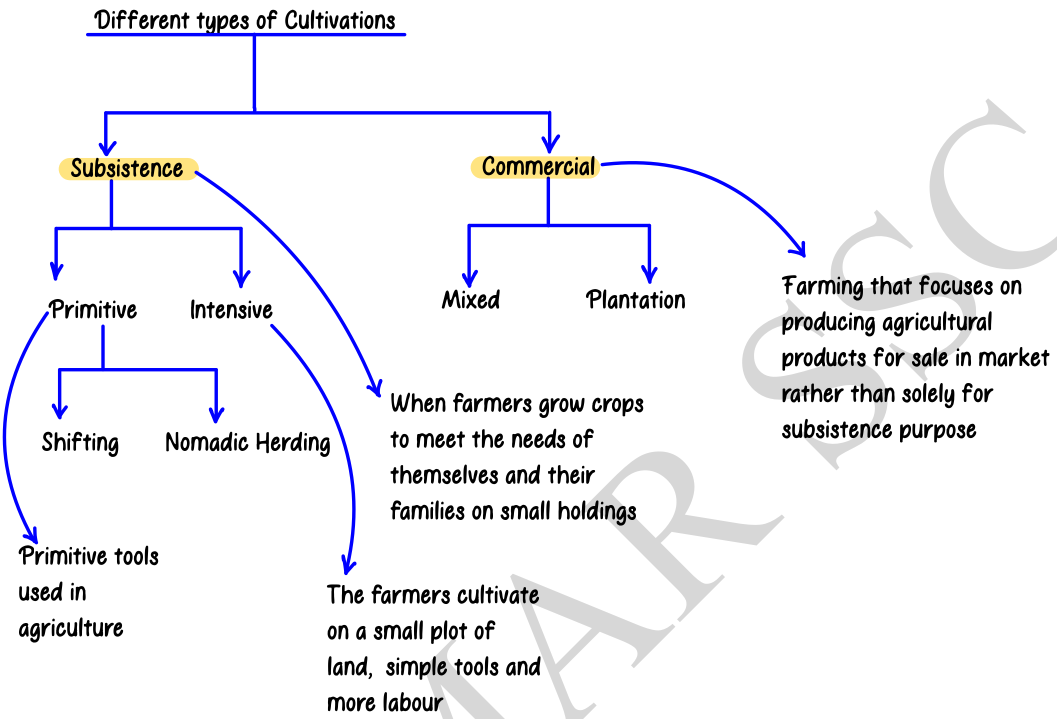
- Abiotic: non-living

IUCN

- Estd: 5 Oct 1948
- Red List of Threatened Species estd: 1964
- HQ: Gland, Switzerland
- Publishes Red List


IUCN
Red list
Gland Switz
1964
Extinct [EX]
Extinct in the Wild [EW]
Threatened categories
Critically Endangered [CR]
Endangered [EN]
Vulnerable [VU]
Near Threatened [NT]
Least Concern [LC]
Data Deficient [DD]
Not Evaluated [NE]
Adequate data
Evaluated
All species
Extinction risk
+
−

AGRICULTURE



Different types of Cultivations

Subsistence
- Primitive
  - Shifting
  - Nomadic Herding
- Intensive

Commercial
- Mixed
- Plantation

Subsistence: When farmers grow crops to meet the needs of themselves and their families on small holdings

Commercial: Farming that focuses on producing agricultural products for sale in market rather than solely for subsistence purpose

Primitive: Primitive tools used in agriculture

Intensive: The farmers cultivate on a small plot of land, simple tools and more labour

- Shifting Agriculture: also known as Slash and burn agriculture

Names across the world
- **Brazil:** Roca
- **Vietnam:** Ray
- **Indonesia:** Ladang
- **Sri Lanka:** Chena

Names across India
- **Western Ghats**: Kumari
- **Chattisgarh**: Dipa
- **Rajasthan**: Waltra
- **Jharkhand:** Kuruwa
- **North East**: Jhum

Mixed Farming

- It is a type of farming which involves both the growing of crops and raising of livestock (Agriculture + Livestock)

Plantation Agriculture

- In this single type of crop or plant is grown in a big part of a land → Factory or processing unit connected

→ Grown to earn profit

- Eg: Cotton, jute, sugarcane, rubber, tea, coffee

Somehow similar

→ Cash crops → Grown to earn the profit in local market

Organic Farming

- Agricultural process that uses biological fertilisers and pesticides acquired from animal or plant waste
- Zero use of artificially made chemicals here

Zero Budget Natural Farming (ZBNF)

- No use of any kind of fertilizers/pesticides

Terrace Farming

- The process of cultivating crops on sites of hills or mountains by planting on graduated terraces carved into the slope
- It is mostly practised in India's hilly regions, such as Himachal Pradesh, Uttarakhand and certain North-Eastern provinces

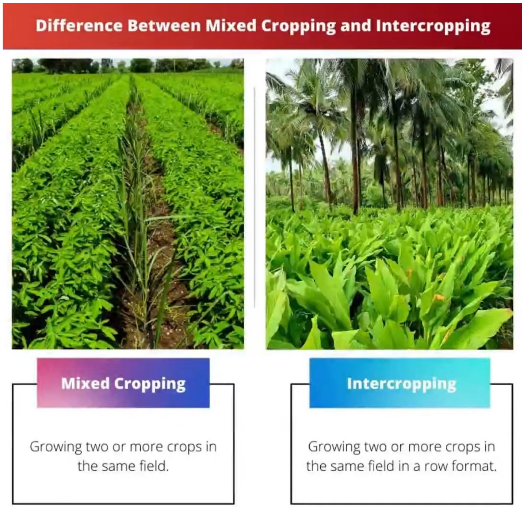
→
- Soil conservation is aided
- Reduces soil erosion

Intercropping and Mixed Cropping

- Similarities: growing two or more crops in the same field

Differences

Mixed Cropping	Intercropping
Seeds of two different crops are mixed before sowing	Seeds are not mixed and grown in a row format



Difference Between Mixed Cropping and Intercropping

Mixed Cropping

Growing two or more crops in the same field.

Intercropping

Growing two or more crops in the same field in a row format.

Different Cropping Seasons

Kharif
- **Sowing**: July
- **Harvesting**: Sept-Oct
- Also known as Monsoon crops

Rabi
- **Sowing**: Oct
- **Harvesting**: April

Zaid
- Short cropping season
- May-June

Kharif crops	Rabi crops	Zaid crops
1. Rice	1. Wheat	~~1. Rice~~
2. Sugar-cane	2. Barley	~~2. Maize~~
3. Jute	3. Gram	3. Melons
4. Cotton	4. Mustard	~~4. Groundnut~~
5. Tobacco	5. Linseed	5. Water melons
6. Maize	6. Pea	6. Cucumber
7. Soya bean	7. Rapeseed	Fodder crops
8. Groundnut	8. Castor	

- Leguminous plants
- Millets

Different Types of Crops

Cotton
- It requires black soil
- Fibre crop and also known as Silver Fibre
- **Requires**: 210 frost free days
- Kharif crop

Jute
- Golden fibre
- **Topmost producer**: India (West Bengal)
- **Topmost exporter**: Bangladesh
- Nor-westers good for growth of jute

Coffee
- **Coffee bowl of the world**: Brazil (topmost producer)
- **India (topmost producer)**: Karnataka

Arabica **Liberica** **Robusta** → Coffee varieties

- Soil: laterite
- Blossom showers help in growth of coffee

Rice

- Also known as paddy before processing
  Sowed in swampy areas → Methane gas is produced
- **Requires:** high rainfall and temperature
- Varieties:
  Aus: grown in March
  Aman: Jan-Feb
  Boro: Oct
- Staple crop

→ India's most consumed staple crops: Rice and Wheat

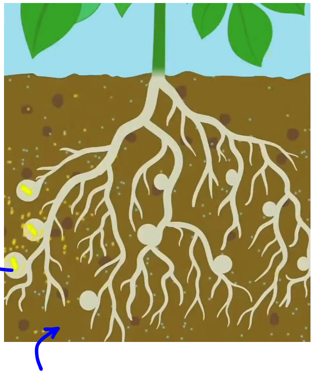
Tea

- Grown in acidic soil
- Moderate rainfall
- Required shadow
- **India (Topmost producer):** Assam
- **In the world (topmost producer):** China

Leguminous crops

- Nitrogen fixing bacteria reside in their roots
- Kharif crops
- **Eg**: Pulse, Rajma, Soyabeans (top producer: MP)

No rhizobium
reside in thier
roots



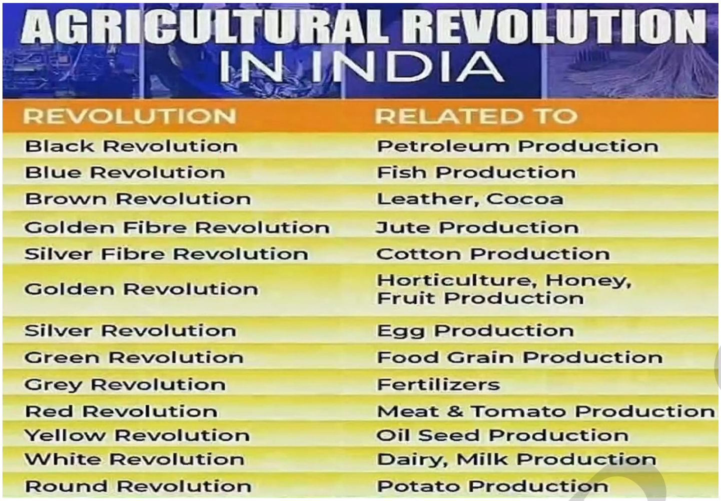
Rhizobium bacteria

N
P
K
→ Macronutrient

Millets

- Also known as Superfoods/Sri Anna
- **Eg**: Bajra, Ragi (finger millets), Jowar (Sorgum)
- **Topmost producer**: Rajasthan

Revolutions



AGRICULTURAL REVOLUTION IN INDIA

REVOLUTION	RELATED TO
Black Revolution	Petroleum Production
Blue Revolution	Fish Production
Brown Revolution	Leather, Cocoa
Golden Fibre Revolution	Jute Production
Silver Fibre Revolution	Cotton Production
Golden Revolution	Horticulture, Honey, Fruit Production
Silver Revolution	Egg Production
Green Revolution	Food Grain Production
Grey Revolution	Fertilizers
Red Revolution	Meat & Tomato Production
Yellow Revolution	Oil Seed Production
White Revolution	Dairy, Milk Production
Round Revolution	Potato Production

Green Revolution (wheat revolution)

→ Spectacular increase in production of food grains

- **1st in:** Mexico + Latin America
- **Term:** William Gaud

Father

- **World:** Norman Borlaug (USA)
- **India:** M S Swaminathan
  - → PL-480 variety of wheat (imported from USA)

In India → Increase in wheat production → Introduction in High Yielding Variety seeds + Technology

In India → It was introduced in two phases

- 1960s → 3rd FYI → **Estd:** FCI, CACP in 1965
- 1970s

In 1st phase → Introduced in Punjab, Andhra

Demerits of Green Revolution

- Groundwater levels ↓
- Soil alkalinity ↑ → Gypsum can be added to reduce soil alkalinity and if the soil is acid then lime can be added

White Revolution (1970-96)

- Also known as "Operation flood"
- Reduced scarcity of milk production in India
- **Father:** Dr. Varghese Kurien

Different Cultures in Agriculture

- **Horticulture:** Culture of Garden crops
- **Viticulture:** Grapes
- **Aquaculture:** Aquatic plants and animals
- **Pisiculture:** Fishes
- **Sericulture:** Silk
- **Apiculture:** Bees
- **Silviculture:** Forest management

- **Hydroponics:** technique of growing plant using water-based nutrient solution rather than soil

Soil Conservation Methods

- **Contour Bunding/Ploughing:** a land management practice for marginal, sloping and hilly land where the soil productivity is very low. It involves placement of the lines of stone along the natural rises of a landscape

- **Mulching:** the process of covering the top soil, with plant material, such as leaves, grass, crop residue, etc → Retains soil moisture

- **Shelter belts:** Planting rows of trees on one side of an area that prevents the wind from eroding the soil

Contour Bunding

Mulching

Shelter belts

One Liners (MCQ)

- "Agriculture Census" is conducted in India at an interval of 5 yrs

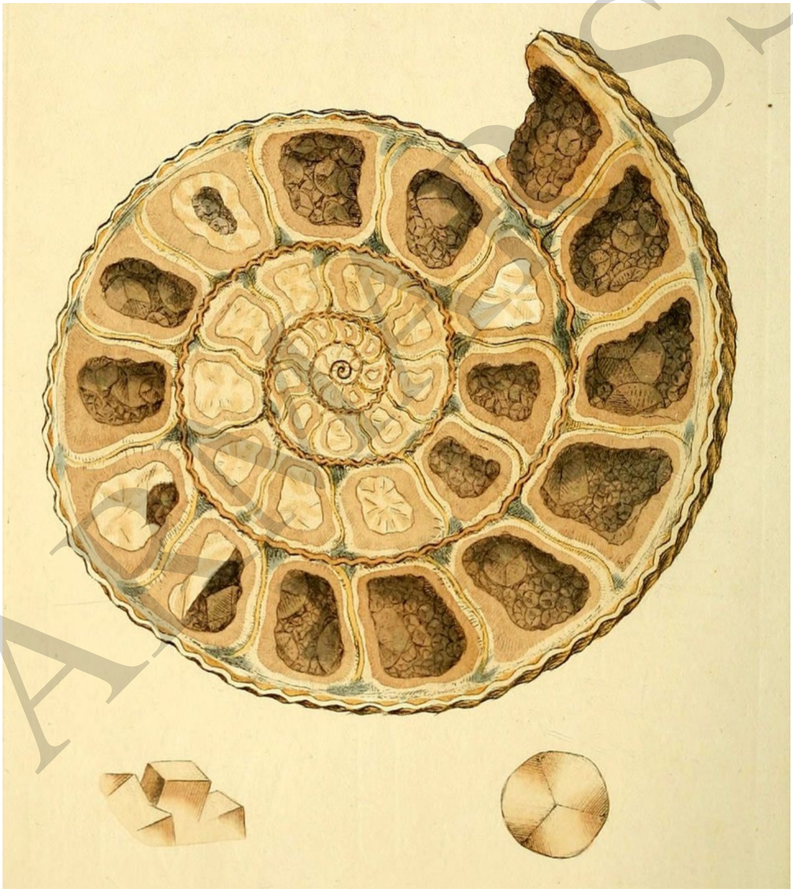
- The technique of watering plants by making use of narrow tubes which deliver water directly at the base of the plant is called: Drip Irrigation

- The word agriculture is derived from the latin words Ager and Culture, where "Ager" means soil

- According to 2009 data by National Institute of Hydrology, 51.09% of land is used for agriculture

One of the adverse effects of DDT is that it can kill beneficial insects like honeybees

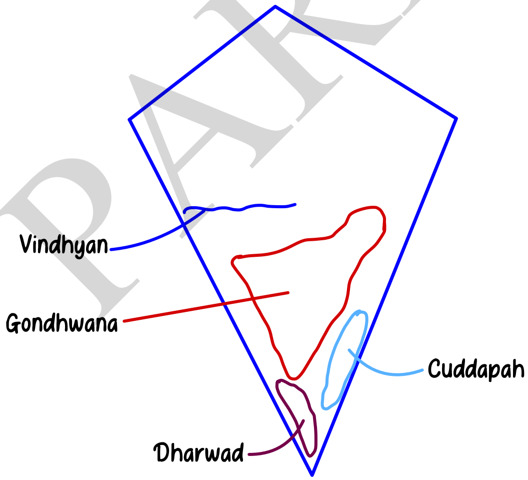
MINERALS



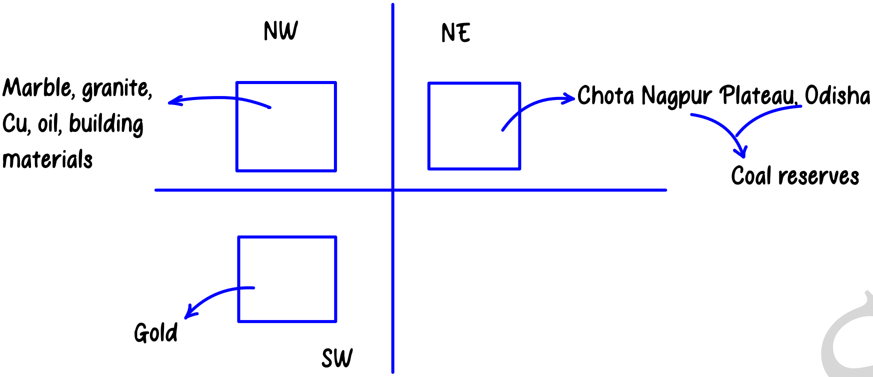
- Minerals
  - Metallic
    - Ferrous
      - Eg: Iron, Manganese, Chromite
    - Non-ferrous
      - Eg: Copper, Bauxite
  - Non-Metallic
    - Fuel Minerals
      - Organic
        - Eg: Fossil fuels, crude oil, natural gas
    - Other Non-metallic Minerals
      - Inorganic
        - Mica, Limestone, Graphite

Mining → Ore = Metal + Impurities
↓
Refining → Gives metals/non-metals

Distribution of Minerals

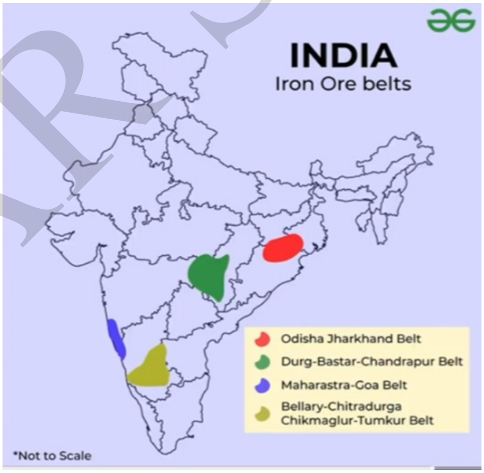


- **Gondhwana**: Gold
- **Dharwad/Cuddapah**: Gold, Iron
- **Vindhyan**: Non-metallic minerals


NW
NE
Marble, granite, Cu, oil, building materials
Chota Nagpur Plateau, Odisha
Coal reserves
Gold
SW

Iron

- Ores
  - Hematite
  - Magnetite → Has highest % of iron (roughly 70%)
  - Limonite


INDIA
Iron Ore belts
🟥 Odisha Jharkhand Belt
🟩 Durg-Bastar-Chandrapur Belt
🟦 Maharastra-Goa Belt
🟨 Bellary-Chitradurga Chikmaglur-Tumkur Belt
*Not to Scale

Reserves

- Topmost: Odisha (Hematite)
- Karnataka (Magnetite)

- Topmost reserve in the world: Australia

Production

- Odisha > Chattisgarh > Karnataka

State	Region	Mines
Odisha	Sundargarh Mayurbhanj Jhar	Badampahar
Jharkhand	Singhbhum	Noamundi
Chhattisgarh	Durg Bastar	Dalli Rajhara Bailadila Dantewada

- Karnataka	Ballari Chikkamangaluru Chitradurga	Baba budan giri Kudremukh

Manganese (Mn)

Reserve

- Topmost in world: South Africa
- Topmost in India: Odisha
  - Sundargarh
  - Keonjhar
  - Kalahandi
  - Mayurbhanj
  - Koraput
  - Karnataka: Ballari, Chikkamangaluru

Bauxite: Ore of Aluminium; non-ferrous

Reserve

- Topmost in world: Australia
- Topmost in India: Odisha

- Jharkhand: Lohardaga, Palamu, Ranchi
- Gujarat: Bhavnagar, Junagarh
- Madhya Pradesh: Katni, Balaghat

Few Aluminium producing Companies and their HQ

- NALCO → HQ: Bhubaneswar (Odisha)
- BALCO → HQ: New Delhi
- HINDALCO → HQ: Mumbai
- Vedanta Resources → HQ: Mumbai

Copper

Production

- Topmost in India: Madhya Pradesh
  - Balaghat (mines)
  - Malajkhand (region)

- **Rajasthan**
  - Jhunjhunu and Alwar (regions)
  - Khetri (mines)
- **Jharkhand:** Singhbhum

Mica: it is used as insulators in electronics and electrical appliances

Production

- **India:** Andhra (top), J & K, Bihar

Gold

- Kolar Gold Fields
- Hutti Gold Mines (Raichur)

} → Karnataka

- Ramagiri: Andhra Pradesh

Diamond

- **India:** Madhya Pradesh (Panna) is the only state that produces diamond
- **Topmost in World**: Russia

Lithium: known as "White Gold"

World

- **Reserve (top):** Chile
- **Production (top)**: Australia

Coal

- Known as "Black Gold" and "Buried Sunshine"
- Calorific value ↑
- Carbon content ↑
- Moisture content ↓

} → Quality of coke

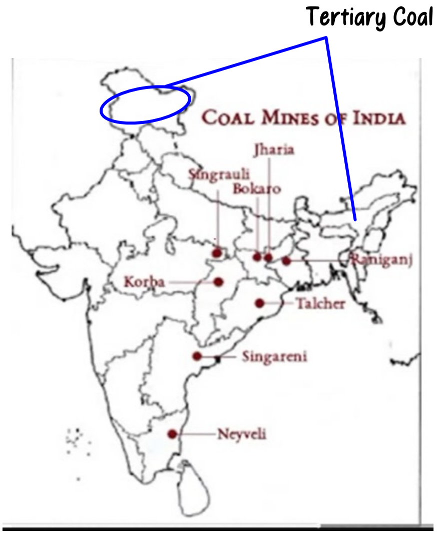
Four varieties

- Anthracite: 80-90%
- Bituminous: 60-80%

> Coking coal (used in metallurgy)

- Lignite: 40-60%
- Peat: <40%
  - → Also found in India
  - → Brown coal

Mostly found in India


Tertiary Coal
Coal Mines of India
Jharia
Singrauli
Bokaro
Raniganj
Korba
Talcher
Singareni
Neyveli

- **Reserve (top):** USA

India

- **Reserve (top):** Odisha > Jharkhand > Chhattisgarh
- **Production (top):** Chhattisgarh > Odisha

States	Mines
Jharkhand	Jharia, Bokaro, Giridih, Karanpura
Chattisgarh	Hasdeo, Korba, Mand-Raigarh
Tamil Nadu	Neyveli
Odisha	Jharsuguda, Talcher, Ib valley

- **Madhya Pradesh**: Singareni (coal mines)

Tertiary Coal: low-grade coal → Seen in J & K, Meghalaya

→ Peat is a tertiary coal

Oil and Natural Gas

→ Largest component of natural gas: Methane

India

- **Western offshore**: Mumbai High, Gujarat
- **Assam**: Digboi

Rare Earth Metals

- **Total**: 17 → 15 lanthanides + 2 (Yttrium, Scandium)
- **Topmost producer+ reserve in world**: China
- **India (topmost):** Kerala (Producer); Andhra (Reserve)

→ Rich in Monazite sand, thorium

One Liners (MCQs)

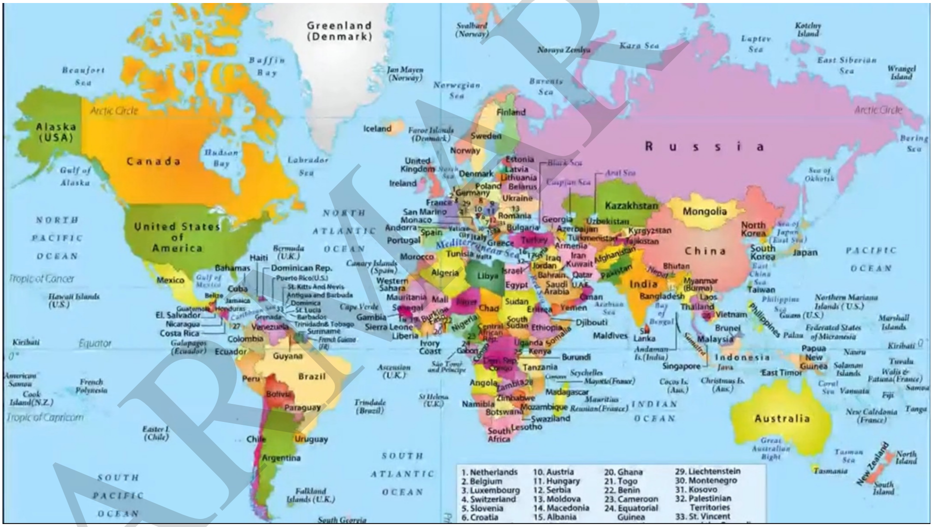
- Main mineral constitutions of continental mass are: Silicon, Aluminium
- Hirakud Captive Thermal Power Plant is located in: Odisha
- The major resources of Gondhwana coal, which are metallurgical coal are located in: Damodar valley
- Peat has low carbon content and high moisture content
- Reserves of silver found in: Odisha, Jharkhand, Andhra, Gujarat
- Amarkantak Plateau, Maikal hills and the plateau region of Bilaspur-katni are known for presence of: Bauxite
- H.V.J gas pipeline from Hazira in Gujarat to Jagdishpur in UP) passes through: Madhya Pradesh
  - H: Hazira in Gujarat
  - V: Vijaipur in MP
  - J: Jagdishpur in UP

  India's 1st interstate gas pipeline, the project began in 1986, with the establishment of GAIL Ltd.

  Guj-Raj-MP-UP-Haryana-Delhi
- Feldspar is a large group of rock-forming silicate minerals that constitutes more than 50% of the Earth's crust and is widely used in the glass and ceramic industries
- Jaduguda is know for Uranium deposits
  - In Singhbhum, Jharkhand

  Also found in Cuddapah, Andhra

WORLD MAP


Greenland (Denmark)
Svalbard (Norway)
Kotelny Island
Laptev Sea
Novaya Zemlya
Kara Sea
East Siberian Sea
Wrangel Island
Beaufort Sea
Baffin Bay
Jan Mayen (Norway)
Norwegian Sea
Barents Sea
Arctic Circle
Alaska (USA)
Canada
Iceland
Faroe Islands (Denmark)
Finland
Sweden
Norway
Russia
Bering Sea
Gulf of Alaska
Hudson Bay
Labrador Sea
United Kingdom
North Sea
Denmark
Estonia
Latvia
Lithuania
Black Sea
Aral Sea
Ireland
Poland
Belarus
Germany
Ukraine
Caspian Sea
Sea of Okhotsk
France
Kazakhstan
Mongolia
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
San Marino
Monaco
Romania
Georgia
Uzbekistan
North Korea
Andorra
Spain
Portugal
Vatican City
Italy
Bulgaria
Azerbaijan
Turkmenistan
Kyrgyzstan
Tajikistan
Sea of Japan (East Sea)
Japan
United States of America
Bermuda (U.K.)
Mediterranean Sea
Greece
Turkey
Armenia
Malta
Tunisia
Morocco
Cyprus
Syria
Lebanon
Iraq
Iran
Afghanistan
Pakistan
China
South Korea
PACIFIC OCEAN
Haiti
Canary Islands (Spain)
Israel
Jordan
Kuwait
Bahrain
Qatar
Nepal
Bhutan
East China Sea
Tropic of Cancer
Bahamas
Dominican Rep.
Puerto Rico (U.S.)
St. Kitts And Nevis
Antigua and Barbuda
Dominica
St. Lucia
Barbados
Trinidad& Tobago
Grenada
Mexico
Gulf of Mexico
Cuba
Jamaica
Belize
Guatemala
Honduras
Caribbean Sea
Western Sahara
Algeria
Libya
Egypt
Saudi Arabia
U.A.E.
Oman
India
Myanmar (Burma)
Taiwan
Hawaii Islands (U.S.)
Cape Verde
Mauritania
Mali
Niger
Chad
Sudan
Eritrea
Yemen
Arabian Sea
Bangladesh
Laos
Thailand
Vietnam
Philippine Sea
Northern Mariana Islands (U.S.)
Guam (U.S.)
EL Salvador
Nicaragua
Costa Rica
Venezuela
Suriname
French Guiana (FR)
Gambia
Senegal
Burkina Faso
Nigeria
Guinea
Sierra Leone
Liberia
Ivory Coast
Central African Rep.
South Sudan
Ethiopia
Djibouti
Somalia
Bay of Bengal
Philippines
Brunei
Palau
Federated States of Micronesia
Marshall Islands
Kiribati
Equator
Galapagos (Ecuador)
Colombia
Ecuador
Guyana
Gabon
Uganda
Kenya
Maldives
Sri Lanka
Andaman Is. (India)
Sumatra
Malaysia
Singapore
Indonesia
Papua New Guinea
Nauru
Kiribati
Burundi
Tanzania
Seychelles
Java
Solomon Islands
Tuvalu
American Samoa
Peru
Brazil
Ascension (U.K.)
Sao Tome and Principe
Congo
Dem. Rep. Congo
Angola
Zambia
Comoros
Mayotte (France)
Cocos Is. (Aus.)
Christmas Is. (Aus.)
East Timor
Coral Sea
Vanuatu
Fiji
Wallis & Futuna (France)
Samoa
French Polynesia
Cook Island (N.Z.)
Bolivia
Paraguay
Trindade (Brazil)
St Helena (U.K.)
Namibia
Zimbabwe
Madagascar
Mozambique
Mauritius
Reunian (France)
Botswana
Swaziland
Lesotho
South Africa
INDIAN OCEAN
Australia
New Caledonia (France)
Tonga
Tropic of Capricorn
Easter I. (Chile)
Chile
Uruguay
Argentina
SOUTH ATLANTIC OCEAN
Great Australian Bight
Tasman Sea
Tasmania
New Zealand
North Island
South Island
SOUTH PACIFIC OCEAN
Falkland Islands (U.K.)
South Georgia
1. Netherlands
2. Belgium
3. Luxembourg
4. Switzerland
5. Slovenia
6. Croatia
10. Austria
11. Hungary
12. Serbia
13. Moldova
14. Macedonia
15. Albania
20. Ghana
21. Togo
22. Benin
23. Cameroon
24. Equatorial Guinea
29. Liechtenstein
30. Montenegro
31. Kosovo
32. Palestinian Territories
33. St. Vincent

Continents

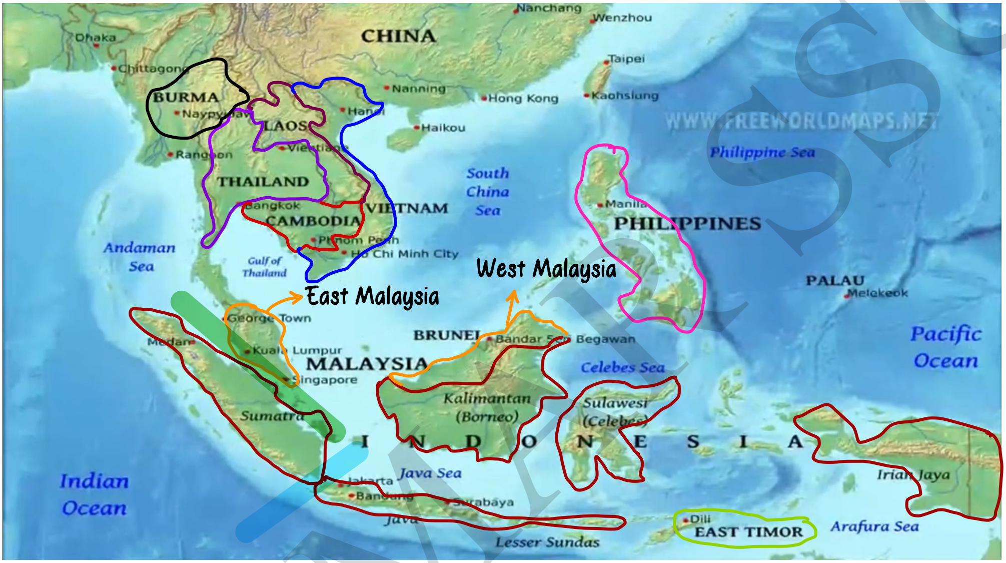
- Top (Area + Population wise): Asia
- 2nd (Area + Population wise): Africa

- Strait: a narrow water body that separates two landmasses/joins two water bodies

🟢 **Strait of Malacca**
- Separates Malaysia and Indonesia
- Joins Java Sea and Andaman Sea

🔵 **Sunda Strait**
- Separates Sumatra and Java
- Joins Java Sea and India Ocean

ASIA


CHINA
Nanchang
Wenzhou
Dhaka
Chittagong
Taipei
BURMA
Naypyidaw
LAOS
Hanoi
Nanning
Hong Kong
Kaohsiung
Haikou
WWW.FREEWORLDMAPS.NET
Philippine Sea
Rangoon
Vientiane
THAILAND
South China Sea
Manila
Bangkok
VIETNAM
PHILIPPINES
CAMBODIA
Phnom Penh
Ho Chi Minh City
Andaman Sea
Gulf of Thailand
West Malaysia
East Malaysia
PALAU
Melekeok
George Town
BRUNEI
Bandar Seri Begawan
Pacific Ocean
Medan
Kuala Lumpur
MALAYSIA
Singapore
Celebes Sea
Kalimantan (Borneo)
Sulawesi (Celebes)
Sumatra
INDONESIA
Jakarta
Java Sea
Irian Jaya
Indian Ocean
Bandung
Surabaya
Java
Dili
EAST TIMOR
Arafura Sea
Lesser Sundas

🟥 Indonesia
🟧 Malaysia
🟩 East Timor
🟪 Thailand
🟥 Cambodia
🟫 Laos
🟦 Vietnam
⬛ Myanmar
🟪 Philippines

INDONESIA

- Country with most no. of Muslim population
- Sumatra (Largest island), Kalimantan, Sulawesi, Java, Papua (5 main islands of Indonesia)
- **Capital:** Jakarta (at present) → Will change to Nusantra

↓

Due to Global Warming

MALAYSIA

- **Capital:** Kuala Lumpur

EAST TIMOR

- **Capital:** Dili

THAILAND

- **Capital:** Bangkok

CAMBODIA

- **Capital:** Phnom Penh

VIETNAM

- **Capital:** Hanoi

LAOS

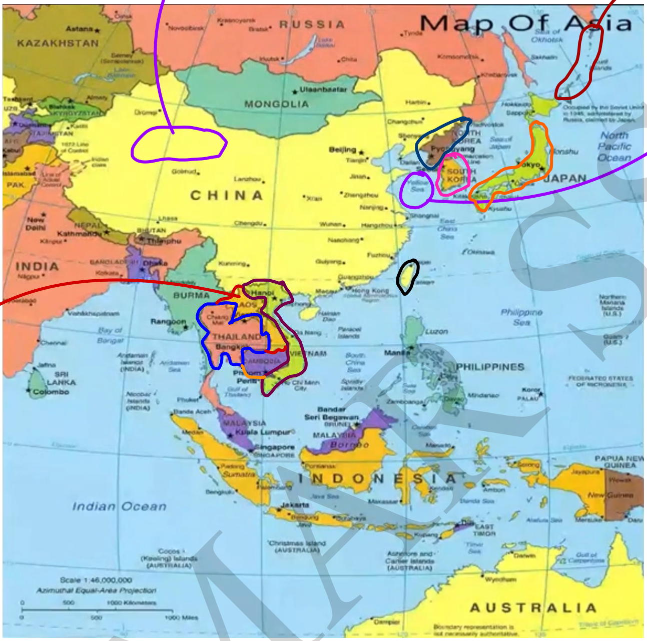
- **Capital:** Vientiane

MYANMAR

- Earlier known as "Burma"
- **Capital:** Nay Pyi Taw

PHILIPPINES

- **Capital:** Manila


Map Of Asia
RUSSIA
KAZAKHSTAN
MONGOLIA
CHINA
INDIA
BURMA
LAOS
THAILAND
CAMBODIA
VIETNAM
PHILIPPINES
MALAYSIA
INDONESIA
SOUTH KOREA
NORTH KOREA
JAPAN
SRI LANKA
NEPAL
BHUTAN
PAK.
PAPUA NEW GUINEA
AUSTRALIA
Indian Ocean
North Pacific Ocean
Philippine Sea
Yellow Sea
Beijing
Tokyo
Hanoi
Bangkok
Jakarta
Singapore
Manila

Gobi Desert

Islands disputed between Japan and Russia

Located between mainland China and Korean Peninsula

A country that is only surrounded by land and no ocean/ coastline

LAOS
- Landlocked country

🟦	South Korea
🟥	North Korea
🟪	Yellow Sea
🟧	Japan
🟫	Kuril Islands
⬛	Taiwan

SOUTH KOREA
- Capital: Seoul
- Shares border with North Korea

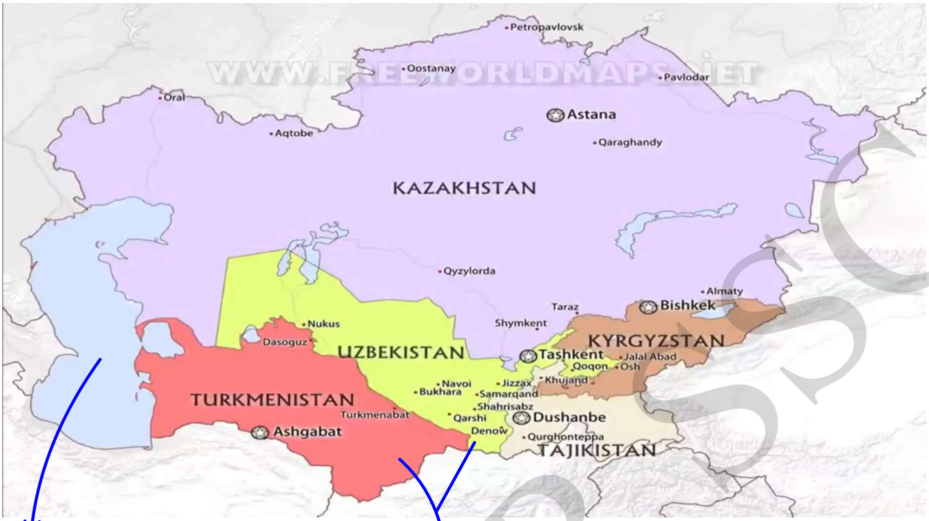
NORTH KOREA
- Capital: Pyongyang
- Shares borders with China and Russia

JAPAN
Largest island: Honshu
- Capital: Tokyo

TAIWAN
- Earlier known as Formosa
- Capital: Taipei

*Lake Baikal: World's deepest lake in Russia

SOUTHWEST ASIA


WWW.FREEWORLDMAPS.NET
Petropavlovsk
Oostanay
Pavlodar
Oral
Astana
Aqtobe
Qaraghandy
KAZAKHSTAN
Qyzylorda
Almaty
Taraz
Bishkek
Shymkent
Nukus
Dasoguz
UZBEKISTAN
KYRGYZSTAN
Tashkent
Jalal Abad
Qoqon
Osh
Khujand
Navoi
Bukhara
Jizzax
Samarqand
Shahrisabz
TURKMENISTAN
Turkmenabat
Qarshi
Dushanbe
Ashgabat
Denow
Qurghonteppa
TAJIKISTAN

Caspian Sea (it is a lake), a landlocked water body of Europe and Asia

All landlocked

TURKMENISTAN
- Capital: Ashgabat

UZBEKISTAN
- Capital: Tashkent

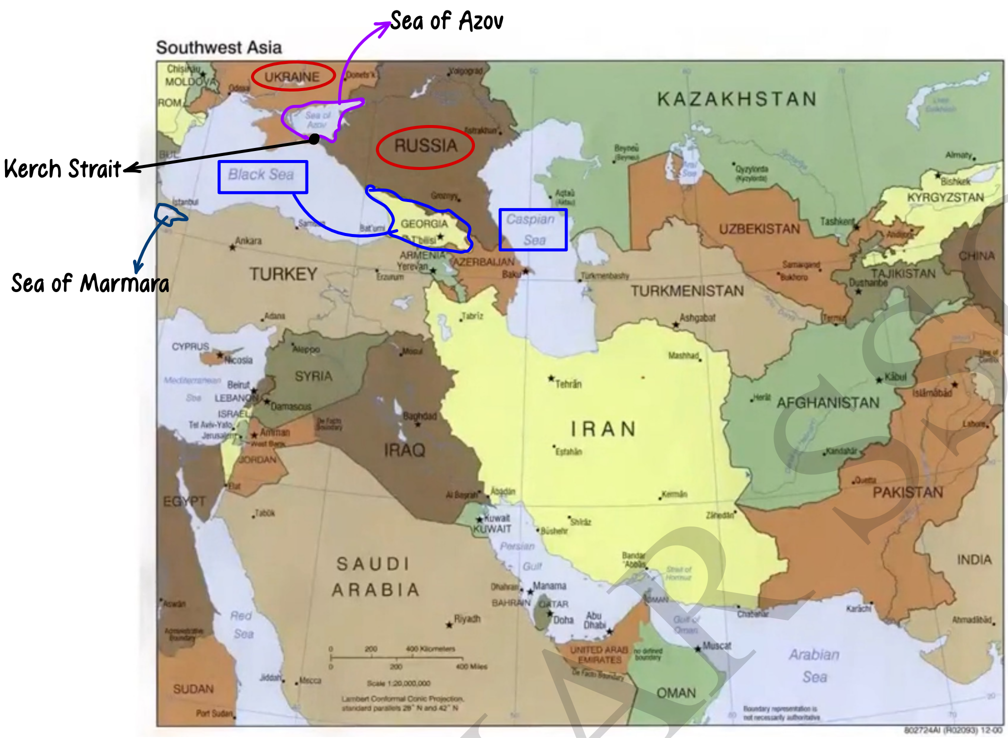
KAZAKHSTAN
- Capital: Astana

TAJIKISTAN
- Capital: Dushanbe

KYRGYZSTAN
- Capital: Bishkek

* Liechtenstein and Uzbekistan are the only doubly landlocked countries

→ Country that is surrounded by landlocked countries


Sea of Azov
Southwest Asia
UKRAINE
RUSSIA
Kerch Strait
Black Sea
Sea of Marmara
GEORGIA
ARMENIA
AZERBAIJAN
Caspian Sea
KAZAKHSTAN
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
CHINA
TURKMENISTAN
TURKEY
CYPRUS
SYRIA
LEBANON
ISRAEL
JORDAN
IRAQ
IRAN
AFGHANISTAN
PAKISTAN
INDIA
EGYPT
KUWAIT
SAUDI ARABIA
BAHRAIN
QATAR
UNITED ARAB EMIRATES
OMAN
SUDAN
Persian Gulf
Red Sea
Arabian Sea
Ankara
Tehrān
Baghdad
Riyadh
Kābul
Islāmābād
Baku
Tbilisi
Yerevan
Damascus
Beirut
Nicosia
Amman
Kuwait
Manama
Doha
Abu Dhabi
Muscat
Ashgabat
Tashkent
Dushanbe
Bishkek
Almaty

*CASPIAN SEA → Surrounding 5 countries

Rivers Volga, Ural, and Terek discharge into the Caspian Sea

- T: Turkmenistan
- A: Azerbaijan
- R: Russia
- I: Iran
- K: Kazakhstan

- Old name: Persia

IRAN
- Capital: Tehran

AZERBAIJAN
- Capital: Baku

*BLACK SEA → Bordered by

Rivers Danube, Dnieper, Dniester discharges in the Black Sea

- The: Turkiye
- Bu: Bulgaria
- R: Russia
- G: Georgia
- U: Ukraine
- R: Romania

KERCH STRAIT
- It connects Black Sea and the Sea of Azov
- Separates Kerch (Ukraine) and Russia

BOSPORUS STRAIT
- It connects the Black Sea to the Sea of Marmara

UKRAINE
- Capital: Kyiv

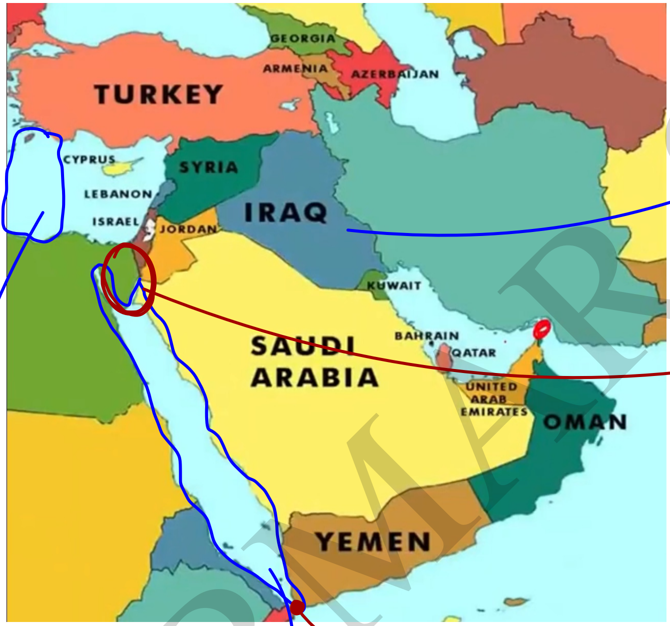
RUSSIA
- Capital: Moscow

TÜRKIYE
- Capital: Ankara
- Spreads across two continents: Europe and Asia

IRAQ
- Old name: Mesopotamia
- Capital: Baghdad

Strait of Hormuz

- Connects the Persian Gulf (west) to the Gulf of Oman and the Arabian Sea (southeast)


GEORGIA
ARMENIA
AZERBAIJAN
TURKEY
CYPRUS
SYRIA
LEBANON
ISRAEL
JORDAN
IRAQ
KUWAIT
BAHRAIN
QATAR
SAUDI ARABIA
UNITED ARAB EMIRATES
OMAN
YEMEN

Referred as "the land between two rivers"

- Tigris and Euphrates rivers

SUEZ CANAL

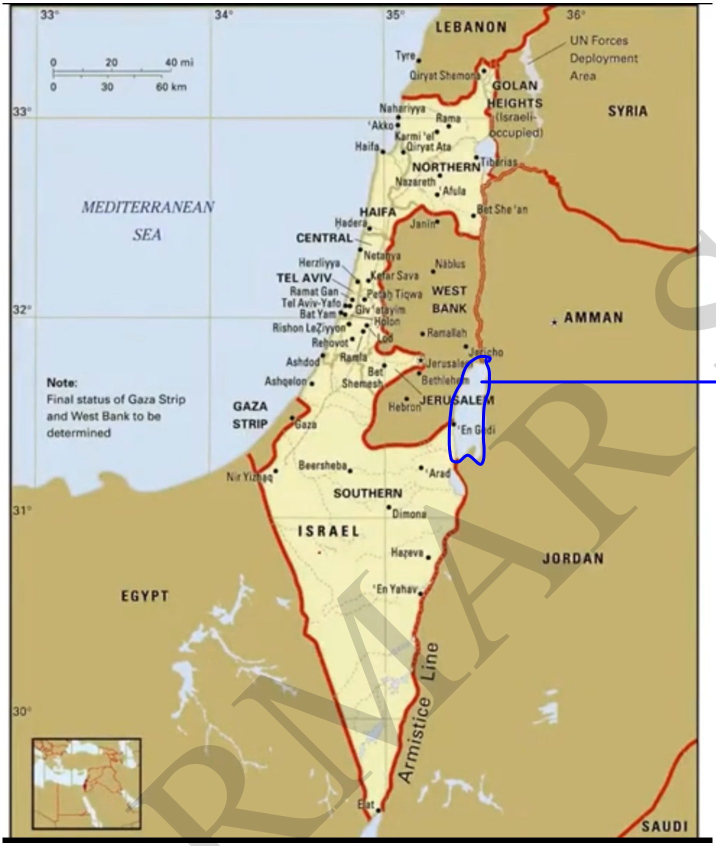
- Connects the Mediterranean Sea to Red Sea

Mediterranean Sea

Red Sea

Bab-al-Mandab Strait (Gateway of Grief or the Gate of Tears)

- Connects the Red Sea to the Gulf of Aden

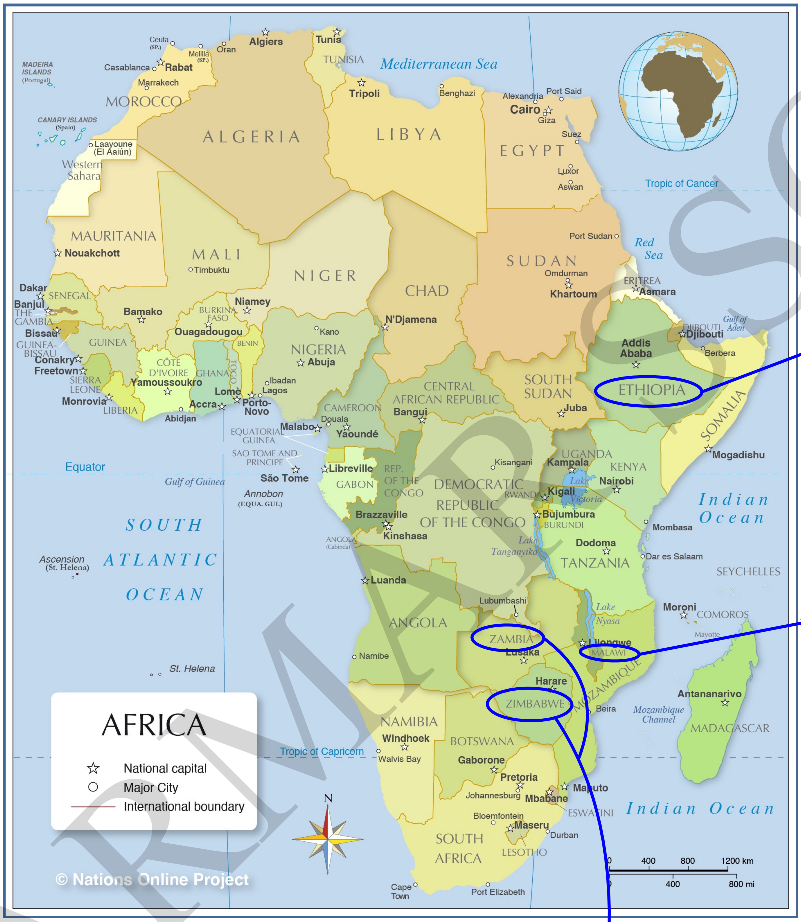

33°
34°
35°
36°
0 20 40 mi
0 30 60 km
LEBANON
Tyre
Qiryat Shemona
GOLAN HEIGHTS (Israeli-occupied)
UN Forces Deployment Area
SYRIA
Nahariyya
'Akko
Rama
Karmi 'el
Haifa
Qiryat Ata
NORTHERN
Tiberias
Nazareth
'Afula
MEDITERRANEAN SEA
HAIFA
Hadera
Janin
Bet She'an
CENTRAL
Netanya
Nablus
Herzliyya
TEL AVIV
Kefar Sava
Ramat Gan
Petah Tiqwa
WEST BANK
Tel Aviv-Yafo
Giv'atayim
Bat Yam
Holon
Rishon LeZiyyon
Rehovot
Lod
Ramallah
AMMAN
Ashdod
Ramla
Jericho
Jerusalem
Bet Shemesh
Bethlehem
Ashqelon
Hebron
JERUSALEM
Note: Final status of Gaza Strip and West Bank to be determined
GAZA STRIP
Gaza
'En Gedi
Beersheba
'Arad
Nir Yizhaq
SOUTHERN
Dimona
ISRAEL
Hazeva
JORDAN
EGYPT
'En Yahav
Armistice Line
Elat
SAUDI

Dead Sea: high salinity

- RED SEA → Bordering countries

D: Djibouti
E: Eritrea
S: Saudi Arabia
S: Sudan
E: Egypt
Y: Yemen

AFRICA


Mediterranean Sea
Tropic of Cancer
Red Sea
Gulf of Aden
Equator
Gulf of Guinea
SOUTH ATLANTIC OCEAN
Indian Ocean
Mozambique Channel
Tropic of Capricorn
MADEIRA ISLANDS (Portugal)
CANARY ISLANDS (Spain)
Ceuta (SP.)
Melilla (SP.)
Oran
Algiers
Tunis
TUNISIA
Casablanca
Rabat
Marrakech
MOROCCO
Laayoune (El Aaiún)
Western Sahara
ALGERIA
LIBYA
Tripoli
Benghazi
EGYPT
Alexandria
Port Said
Cairo
Giza
Suez
Luxor
Aswan
MAURITANIA
Nouakchott
MALI
Timbuktu
NIGER
Niamey
CHAD
N'Djamena
SUDAN
Port Sudan
Omdurman
Khartoum
ERITREA
Asmara
DJIBOUTI
Djibouti
Berbera
Addis Ababa
ETHIOPIA
SOMALIA
Mogadishu
Dakar
SENEGAL
Banjul
THE GAMBIA
Bissau
GUINEA-BISSAU
GUINEA
Conakry
Freetown
SIERRA LEONE
Monrovia
LIBERIA
Bamako
BURKINA FASO
Ouagadougou
CÔTE D'IVOIRE
Yamoussoukro
Abidjan
GHANA
Accra
TOGO
Lomè
BENIN
Porto-Novo
NIGERIA
Kano
Abuja
Ibadan
Lagos
CAMEROON
Douala
Yaoundé
Malabo
EQUATORIAL GUINEA
SAO TOME AND PRINCIPE
São Tome
Annobon (EQUA. GUI.)
Libreville
GABON
REP. OF THE CONGO
Brazzaville
Kinshasa
CENTRAL AFRICAN REPUBLIC
Bangui
SOUTH SUDAN
Juba
UGANDA
Kampala
KENYA
Nairobi
Mombasa
Kisangani
DEMOCRATIC REPUBLIC OF THE CONGO
RWANDA
Kigali
Lake Victoria
Bujumbura
BURUNDI
Lake Tanganyika
Dodoma
TANZANIA
Dar es Salaam
SEYCHELLES
ANGOLA (Cabinda)
Luanda
ANGOLA
Lubumbashi
Lake Nyasa
Lilongwe
MALAWI
Moroni
COMOROS
Mayotte
ZAMBIA
Lusaka
Harare
ZIMBABWE
MOZAMBIQUE
Beira
Antananarivo
MADAGASCAR
Namibe
NAMIBIA
Windhoek
Walvis Bay
BOTSWANA
Gaborone
Pretoria
Johannesburg
Mbabane
Maputo
ESWATINI
Bloemfontein
Maseru
Durban
LESOTHO
SOUTH AFRICA
Cape Town
Port Elizabeth
Ascension (St. Helena)
St. Helena
AFRICA
☆ National capital
○ Major City
International boundary
N
0 400 800 1200 km
0 400 800 mi
© Nations Online Project

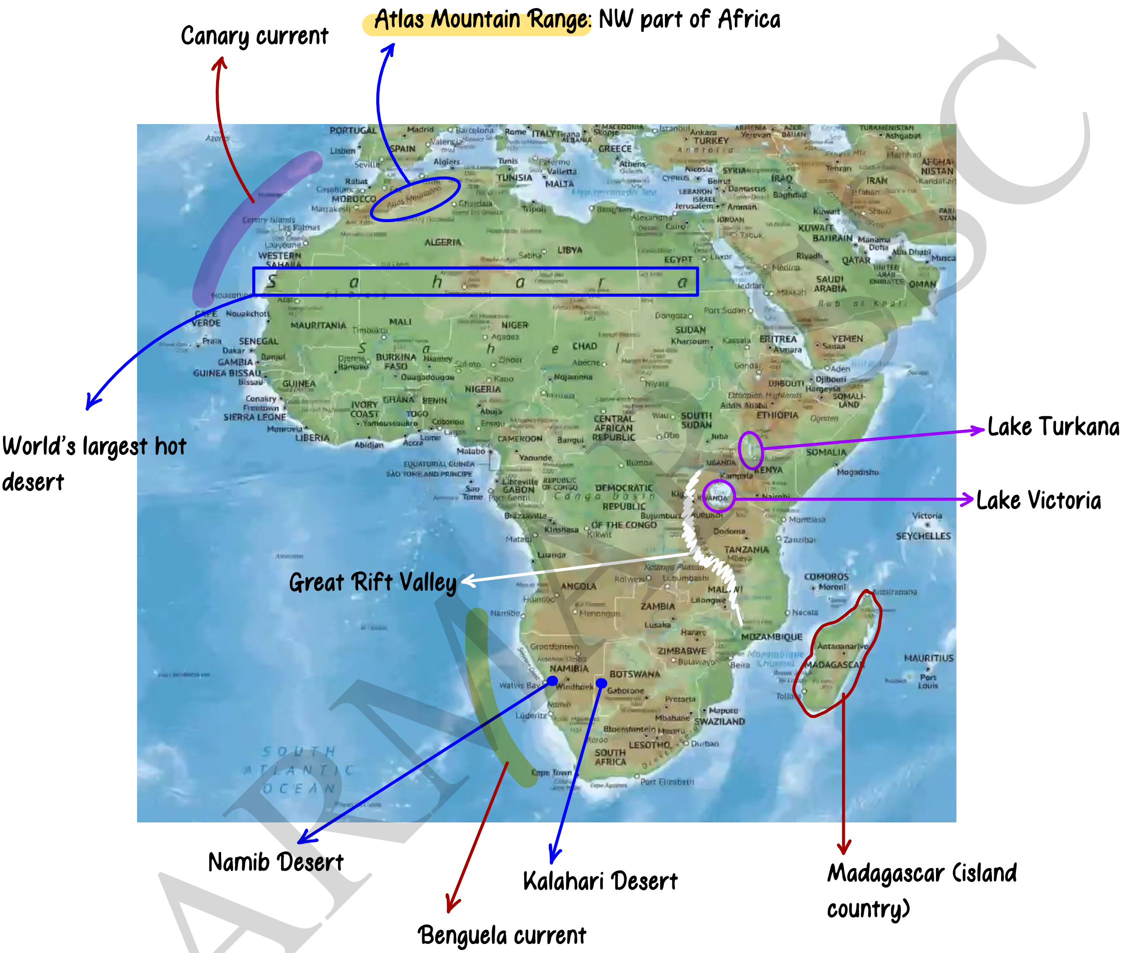
Old name: Abyssinia

Old name: Nyasaland

- Zimbabwe + Zambia (previously known as) → Rhodesia

AFRICA

- Known as "Continent of Continents"
- Known as Dark Continent and Black Continent


PORTUGAL
SPAIN
MOROCCO
Atlas Mountains
ALGERIA
TUNISIA
LIBYA
EGYPT
WESTERN SAHARA
S a h a r a
MAURITANIA
MALI
NIGER
CHAD
SUDAN
ERITREA
ETHIOPIA
SOMALIA
KENYA
TANZANIA
NIGERIA
CAMEROON
CENTRAL AFRICAN REPUBLIC
DEMOCRATIC REPUBLIC OF THE CONGO
GABON
ANGOLA
ZAMBIA
ZIMBABWE
MOZAMBIQUE
MADAGASCAR
NAMIBIA
BOTSWANA
SOUTH AFRICA
SOUTH ATLANTIC OCEAN

Atlas Mountain Range: NW part of Africa

Canary current

World's largest hot desert

Lake Turkana

Lake Victoria

Great Rift Valley

Namib Desert

Kalahari Desert

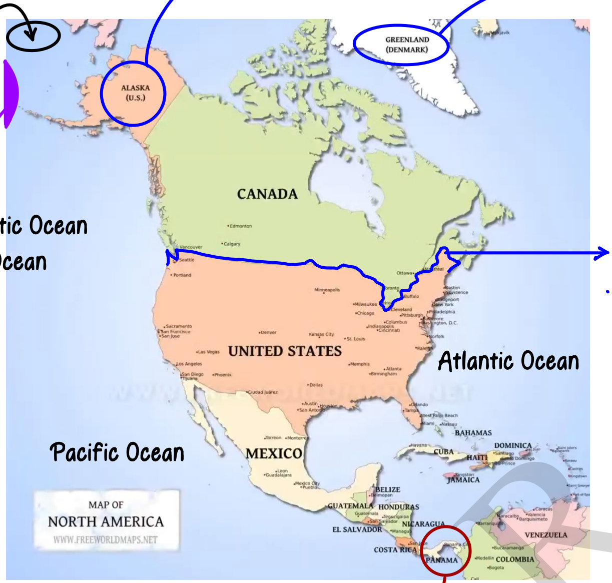
Benguela current

Madagascar (island country)

- **Longest river of the world:** Nile (formed from Blue Nile + White Nile)
  - **Empties in:** Mediterranean Sea
  - **Origin:** Lake Victoria of Tanzania
  - **Empties at:** Mediterranean Sea

- **Highest peak of Africa:** Mt. Kilimanjaro

NORTH AMERICA



ALASKA (U.S.)
GREENLAND (DENMARK)
CANADA
UNITED STATES
MEXICO
Atlantic Ocean
Pacific Ocean
BAHAMAS
CUBA
HAITI
DOMINICA
JAMAICA
BELIZE
GUATEMALA
HONDURAS
EL SALVADOR
NICARAGUA
COSTA RICA
PANAMA
VENEZUELA
COLOMBIA
MAP OF
NORTH AMERICA
WWW.FREEWORLDMAPS.NET

Earlier was part of Russia

Largest Island

Arctic Ocean

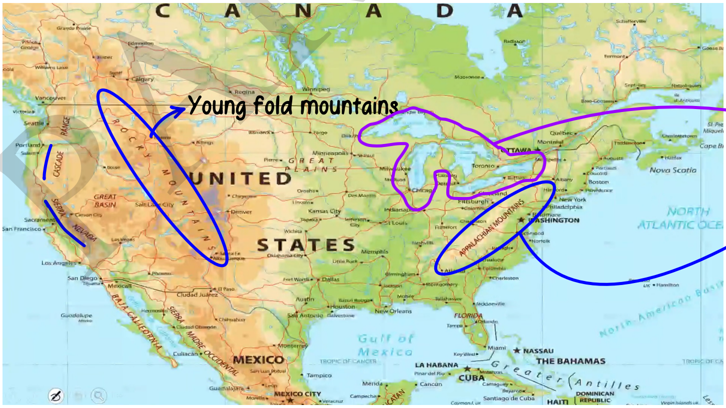
Bering Strait
- Connects Arctic Ocean
- and Pacific Ocean

49th Parallel Line
- Boundary between USA and Canada

Panama Canal
- Connects the Atlantic Ocean with Pacific Ocean

Links North America and South America

NORTH AMERICA



CANADA
UNITED STATES
MEXICO
Young fold mountains
ROCKY MOUNTAINS
CASCADE RANGE
SIERRA NEVADA
GREAT BASIN
GREAT PLAINS
APPALACHIAN MOUNTAINS
OTTAWA
WASHINGTON
NORTH ATLANTIC OCEAN
Gulf of Mexico
THE BAHAMAS
CUBA
MEXICO CITY

CANADA
- **Capital:** Ottawa

Great Lakes: Near Canada-USA border

Old fold mountains

Great Lakes consists of
- **H**: Huron
- **O**: Ontario
- **M**: Michigan
- **E**: Erie
- **S**: Superior

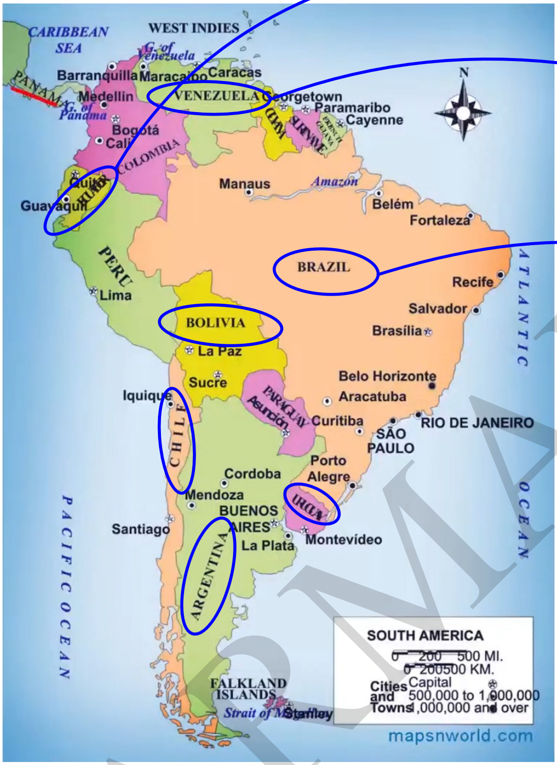
Desert
- Mojave Desert
- Sonoran Desert

- **Lake Superior**: largest freshwater lake in the world

- **Highest peak of North America**: Mt. McKinley (also called Denali)

SOUTH AMERICA

ECUADOR
- **Capital**: Quito
- First country from which equator passes


CARIBBEAN SEA
WEST INDIES
G. of Venezuela
Barranquilla
Maracaibo
Caracas
PANAMA
G. of Panama
Medellin
VENEZUELA
Georgetown
Paramaribo
Cayenne
GUYANA
SURINAME
FRENCH GUIANA
N
Bogotá
Cali
COLOMBIA
Quito
ECUADOR
Guayaquil
Manaus
Amazon
Belém
Fortaleza
PERU
Lima
BRAZIL
Recife
Salvador
Brasília
BOLIVIA
La Paz
Sucre
Belo Horizonte
Aracatuba
Iquique
PARAGUAY
Asunción
Curitiba
RIO DE JANEIRO
SÃO PAULO
CHILE
Porto Alegre
Cordoba
Mendoza
URUGUAY
BUENOS AIRES
Montevideo
Santiago
La Plata
ARGENTINA
ATLANTIC OCEAN
PACIFIC OCEAN
FALKLAND ISLANDS
Strait of Magellan
Stanley
SOUTH AMERICA
0 200 500 MI.
0 200 500 KM.
Cities and Towns
Capital
500,000 to 1,000,000
1,000,000 and over
mapsnworld.com

VENEZUELA
- Capital: Caracas

BRAZIL
- **Capital**: Brasilia
- **Currency**: Brazilian Real

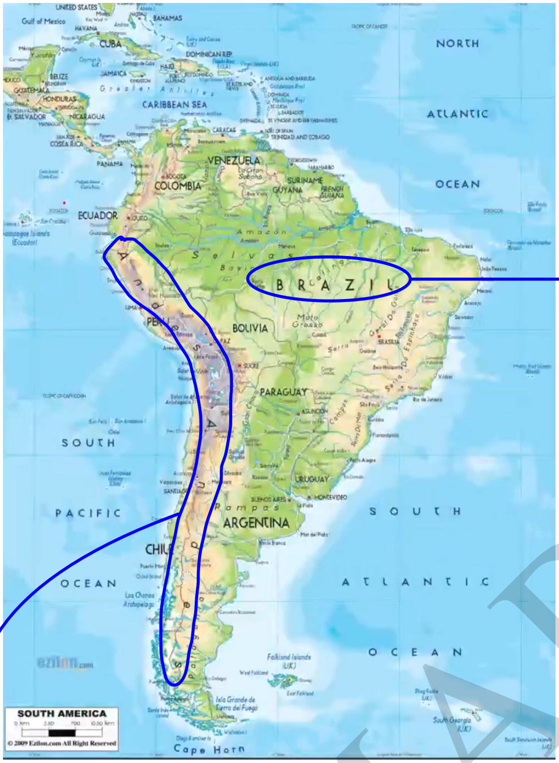
CHILE
- **Capital**: Santiago

PARAGUAY
- **Capital**: Asuncion

ARGENTINA
- **Capital**: Buenos Aires

BOLIVIA
- **Capital**: La Paz

URUGUAY
- Capital: Montevideo


NORTH ATLANTIC OCEAN
CARIBBEAN SEA
VENEZUELA
COLOMBIA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
URUGUAY
ARGENTINA
CHILE
SOUTH PACIFIC OCEAN
SOUTH ATLANTIC OCEAN
Andes
Amazon
SOUTH AMERICA
Cape Horn

Amazon forest

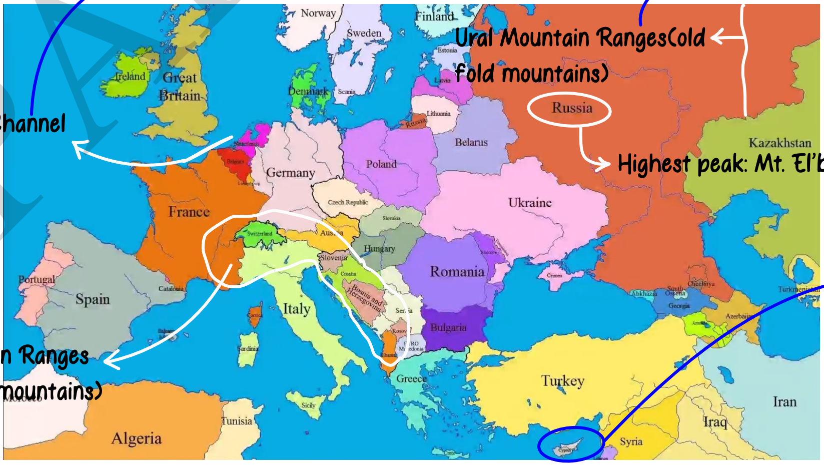
ANDES MOUNTAIN RANGE (World's longest chain of mountains)

- Young fold mountains
- Highest peak: Mt. Aconcagua (Argentina)
- Driest desert: Atacama Desert

EUROPE

Arati Saha was 1st Indian women swimmer to cross the English Channel

Separates Europe and Asia


Norway
Sweden
Finland
Ireland
Great Britain
Denmark
Russia
Belarus
Poland
Germany
France
Ukraine
Kazakhstan
Czech Republic
Austria
Hungary
Romania
Switzerland
Italy
Spain
Portugal
Bulgaria
Greece
Turkey
Syria
Iraq
Iran
Algeria
Tunisia

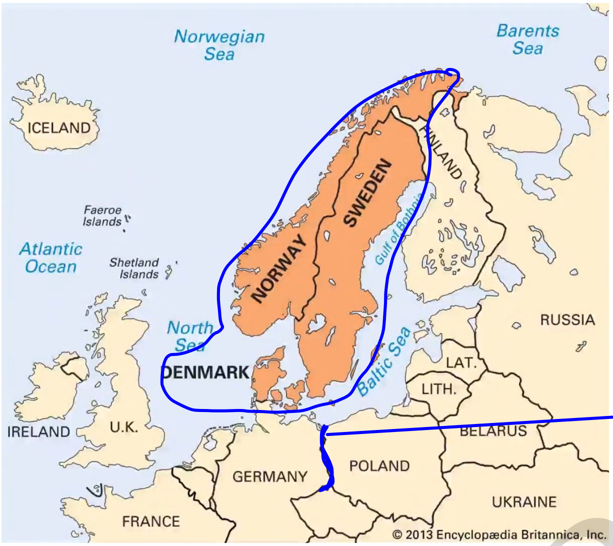
Ural Mountain Ranges(old fold mountains)

Highest peak: Mt. El'brus

English Channel

Alps Mountain Ranges (Young fold mountains)

CYPRUS
- Underwater canyon: Eratosthenes


Norwegian Sea
Barents Sea
ICELAND
Faeroe Islands
Atlantic Ocean
Shetland Islands
North Sea
NORWAY
SWEDEN
FINLAND
Gulf of Bothnia
Baltic Sea
RUSSIA
LAT.
LITH.
DENMARK
IRELAND
U.K.
BELARUS
GERMANY
POLAND
UKRAINE
FRANCE
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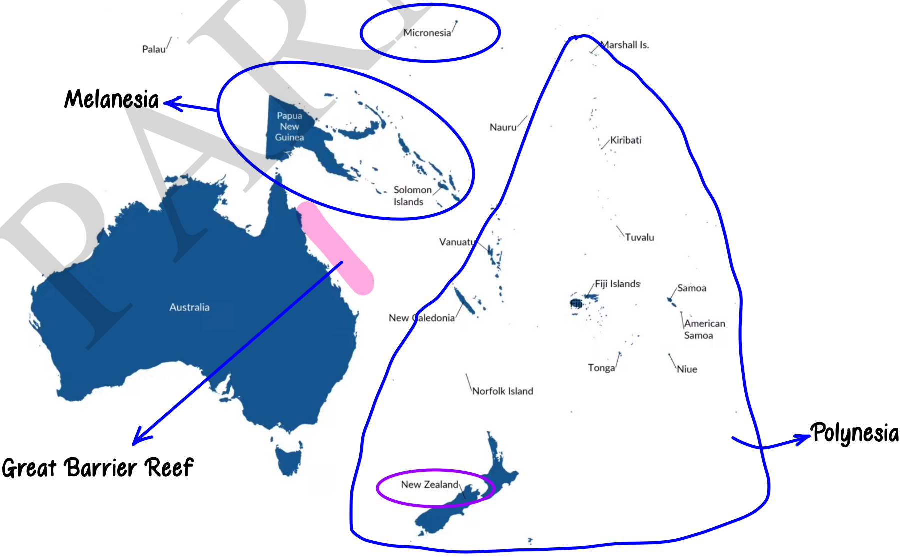
Hindenburg Line between Germany and Poland (German defensive line in French territory during World War I)

- **Scandinavian countries:** Norway + Sweden + Denmark
- **Nordic countries:** Denmark + Finland + Sweden + Norway + Iceland

- **Block mountain in Germany:** Rhine Valley
- Vosges mountain in France

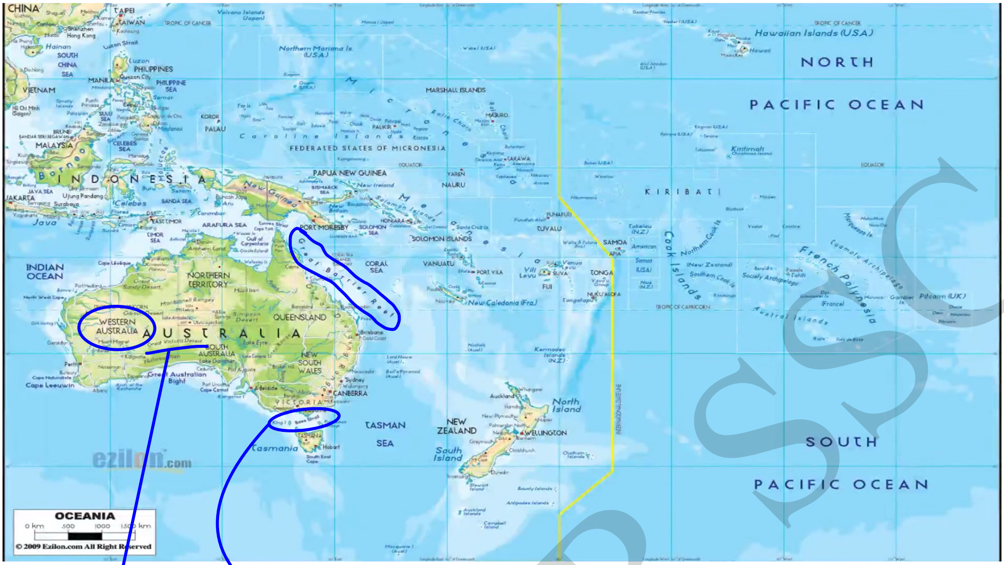
OCEANIA


Palau
Micronesia
Marshall Is.
Papua New Guinea
Nauru
Kiribati
Solomon Islands
Tuvalu
Vanuatu
Fiji Islands
Samoa
American Samoa
New Caledonia
Australia
Tonga
Niue
Norfolk Island
New Zealand

Melanesia

Great Barrier Reef

Polynesia


CHINA
TAIPEI
TAIWAN
PHILIPPINES
VIETNAM
MALAYSIA
Borneo
INDONESIA
Java
JAKARTA
Celebes
EAST TIMOR
ARAFURA SEA
PAPUA NEW GUINEA
PORT MORESBY
Northern Mariana Is. (USA)
MARSHALL ISLANDS
FEDERATED STATES OF MICRONESIA
PALAU
NAURU
KIRIBATI
SOLOMON ISLANDS
TUVALU
SAMOA
VANUATU
FIJI
TONGA
New Caledonia (Fra.)
Cook Islands
French Polynesia
Hawaiian Islands (USA)
NORTH
PACIFIC OCEAN
SOUTH
PACIFIC OCEAN
INDIAN OCEAN
CORAL SEA
Great Barrier Reef
NORTHERN TERRITORY
WESTERN AUSTRALIA
AUSTRALIA
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
CANBERRA
Sydney
Brisbane
Great Australian Bight
Bass Strait
Tasmania
TASMAN SEA
NEW ZEALAND
North Island
South Island
WELLINGTON
Auckland
OCEANIA
0 km 500 1000 1500 km
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Bass Strait

Great Australian Desert (Gibson Desert)

ARCTIC

- India's first research centre: HIMADRI

Estd: 2008

ANTARCTICA

- **Highest peak**: Mt. Vinson
- **Indian Research Centre in Antarctica**: Bharati, Dakshin Gangotri, Maitri

Estd: 1984